CQ Inc.

Coal Cleanability Characterization of Pratt and Utley Seam Coals

to

U.S. Department of Energy
Pittsburgh, Pennsylvania
DE-FC22-90PC89663

Electric Power Research Institute
Palo Alto, California
RP1400-25

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Prepared for:

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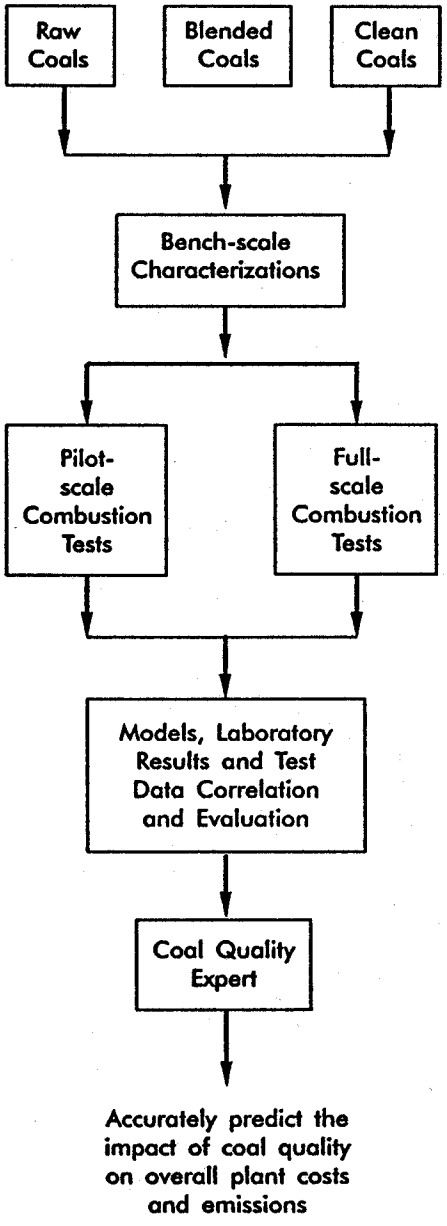
- Mr. Raymond Iversen, who arranged for the donation of the tests coals and Mr. Michael Wray of The Pittsburg and Midway Coal Mining Co. who provided demographic information and raw coal data for the test coals.

- Mr. Robert L. Barnett of the Geological Survey of Alabama, who provided seam mining and reserve information for the two coals.

EXECUTIVE SUMMARY

Coal Quality Expert Project Flow



CQ Inc., a wholly-owned subsidiary of the Electric Power Research Institute (EPRI), performed a Coal Cleanability Characterization on 400 tons of Pratt and 100 tons of Utley Seam coals. Coal for this test program was donated from The Pittsburg and Midway Coal Mining Company (P&M). The Pratt coal was mined at P&M's underground North River No. 1 Mine located in Fayette County, Alabama; the Utley was from its Meg No. 5 surface mine in nearby Tuscaloosa County. The work was performed in December 1991 and January 1992 as part of a Clean Coal Technology project sponsored by the Department of Energy (DOE) and EPRI. The objective of the project is to develop a sophisticated computer model, the Coal Quality Expert, that will help to reduce power plant emissions and power production costs.

The project is a logical and essential extension of extensive R&D performed in the past under DOE sponsorship. The 42-month project, managed by CQ Inc. and ABB Combustion Engineering Systems Division, will demonstrate the economic and environmental benefits of coal cleaning to enhance the use of U.S. coals for electrical power generation. The work falls under DOE's Clean Coal Technology Program in the category of "Advanced Coal Cleaning."

The main objectives of this project are to:

- Enhance EPRI's Coal Quality Information System (CQIS) database and Coal Quality Impact Model (CQIM) to allow confident assessment of the effect of cleaning on specific boiler cost and performance.

- Develop and validate a computer workstation, called the Coal Quality Expert (CQE), which allows accurate and detailed predictions of coal quality impacts on total power plant capital cost, operating costs, and performance based on inputs from inexpensive bench tests.

Project Tasks

The project consists of seven tasks:

Task 1: Project Management

Task 2: Coal Cleanability Characterization

Task 3: Pilot-Scale Combustion Testing

Task 4: Utility Boiler Field Testing

Task 5: CQIM Completion and Development of CQE Specifications

Task 6: CQE Development
Coal Cleanability Characterizations are comprised of five segments:

- Raw Coal Characterization
- Impurities Liberation Testing
- Laboratory Froth Flotation
- Commercial-scale Flowsheet Testing
- Combustion Characteristics Comparison

Task 7: CQE Workstation Testing and Validation

CQ Inc. Role

CQ Inc. is responsible for Task 2. CQ Inc. owns and operates the Coal Quality Development Center (CQDC), located 50 miles east of Pittsburgh, Pennsylvania. The CQDC is equipped with a commercial-scale coal cleaning facility capable of performing coal cleaning characterizations. Such characterizations are extensive evaluations of a raw coal's size, quality, and predicted cleaning potential. These studies help determine whether cleaning is a cost-effective emissions control alternative.

Results

The raw-coal characterizations showed that the Pratt and Utley Seam coals are high volatile A bituminous coals. SO_2 emissions potential for Pratt Seam coal was 3.95 lb/MBtu and 6.05 lb/MBtu for the Utley Seam coal. The ash loadings for the Pratt Seam coal was 24.00 lb/MBtu and 12.12 lb/MBtu for the Utley Seam.

Significant amounts of impurities liberation occurred in both the raw coals. The coal cleaning evaluation showed that conventional cleaning devices such as jigs, water-only cyclones and concentrating tables can significantly reduce the overall ash content of both the Pratt and Utley Seam coals.

Because of the relatively high ash content of the two raw coals, plant yields were low when the raw coals were cleaned using a simple concentrating table flowsheet - 52 percent when cleaning the Pratt Seam coal and 58 percent cleaning the Utley. However, cleaning a raw coal blend in a flowsheet featuring heavy-media cyclones and froth flotation produced a plant yield of 72 percent with an energy recovery of 89 percent. Overall, as with plant yields, energy recoveries were low to moderate (63 percent - 89 percent). However, even at these energy recoveries, SO_2 emissions potential reductions ranged from 22 percent to 26 percent.

The data from this characterization will be incorporated into two of the more than 20 software models and databases that will be integrated to form the Coal Quality Expert:

- EPRI's Coal Quality Information System (CQIS), a database of coal characteristics and cleaning potential.

- The Quality Impact Model (CQIM), a commercial program that gives the bottom-line cost of burning a given coal in a particular boiler.

INTRODUCTION

Because the electric power generation industry must meet the ever increasing requirements of regulatory agencies and consumers, coal-fired utilities need a way to evaluate how specific coals will behave in their plants before purchasing them. Taking advantage of state-of-the-art computer technology, the Department of Energy and the Electric Power Research Institute (EPRI), under the Clean Coal Technology Program, are developing the Coal Quality Expert (CQE), a sophisticated yet user-friendly computer software program. CQE will provide the utility industry with a PC expert system to confidently and inexpensively evaluate the impacts of specific coals on given utility boilers. Intended to demonstrate the economics and environmental benefits of cleaning coal, CQE will enhance the use of physically-cleaned U.S. coals to reduce emissions and power production costs.

Data collected and analyzed on raw and cleaned coals during development of CQE will also be used to upgrade EPRI's Coal Quality Information System (CQIS™)--a database of coal characteristics and cleaning potential--and Coal Quality Impact Model (CQIM™)--a commercialized program that gives the bottom line cost of burning a given coal in a particular boiler.

When the project is complete, CQ Inc. (a subsidiary of EPRI) will have performed Coal Cleanability Characterizations on 17 raw coals used in this project. Of these raw coals, seven will also have undergone extensive cleaning at CQ Inc.'s Coal Quality Development Center.

Coal Cleanability Characterizations are extensive evaluations of a raw coal's size, quality, and predicted cleaning potential. Also included are raw coal liberation studies (which determine the extent to which crushing liberates ash and pyrite) and cleaning studies to evaluate each raw coal's susceptibilities to cleaning in various processes. These studies can help to determine whether cleaning is a cost-effective emissions control alternative. They also can help identify the source of site-specific boiler problems related to a coal's quality. While providing generic information for the coal-producing and electric utility industries, these studies are designed to satisfy the overall needs of the project and its participants.

Coal Cleanability Characterizations routinely measure the extent to which a particular coal can be cleaned through a series of laboratory and commercial-scale tests. To date, CQ Inc. has characterized the cleanability of more than 30 nationally important utility coals, including coals from 12 states and two Canadian provinces.

Specifically, a coal cleanability characterization can be divided into three main components:

- Raw-coal characterization
- Liberation studies
- Commercial-scale cleaning tests

A raw coal characterization uses extensive laboratory analyses from size and washability tests to provide general information about the quality of a raw coal. Liberation studies help determine the degree of pure coal (or conversely mineral matter) that can be liberated by progressive crushing. Commercial-scale cleaning tests allow engineers to select and test coal cleaning devices capable of effectively and efficiently cleaning a particular coal.

The data gathered from these tests and from coal cleaning tests done on project-specified raw coals will be used in bench-scale characterizations to assess raw coal quality, predict and verify the effects of coal cleaning, and finally to predict boiler performance and emissions for a specific coal. Pilot- and six full-scale combustion test burns using the project coals will gather additional data relating to coal quality impacts on specific power plant costs and performance.

The results of the above laboratory and test data will then be evaluated and correlated to develop new models and to validate existing models that will comprise the integrated CQE program. This program will allow detailed predictions of coal quality impacts on total plant capital costs, operating costs, and performance based on inputs from inexpensive bench-scale tests.

Plant Gaston Test Program

Alabama Power Company is one of the six host utilities involved in this project. Alabama Power Company is interested in assessing coal quality impacts on boiler performance and emissions at its Plant Gaston Unit 5 in

Wilsonville, Alabama. This large 880 megawatt tangentially-fired unit has occasionally experienced water wall wastage and deposits in the lower furnace. The boiler at this unit was designed to burn a high sulfur (3.5 percent) mid-western bituminous coal with a heating value of 11,000 Btu/lb. Presently, Alabama Power Company burns, among others, coal from the Pittsburg & Midway Coal Mining Company's North River Mine, which mines the Pratt and Utley Seams in Alabama.

In order to investigate the impact of the two coals on Gaston's Unit 5 boiler and to gather information on whether these same coals can be cleaned further to decrease slagging and fouling tendencies and to potentially reduce emissions, the research team involved in this project developed a comprehensive test plan.

Test Plan

The test plan called for Pratt and Utley Seam coals to be physically cleaned in different flowsheet tests so that at least one test would produce a minimum clean coal energy recovery of 86 percent. Also, a 30-ton composite sample of coal received at the power plant from the North River mine was shipped to Combustion Engineering in Windsor, Connecticut, for pilot-scale combustion tests.

These combustion tests were designed to simulate the firing properties of burning the coal blend in the Gaston Station's boiler. This part of the project was completed in June 1992 and the results are not expected to be released until early 1993. Some of the information gathered from these tests will be used to help determine whether further cleaning of the North River coal can improve the overall performance of Unit 5.

Figure 1 illustrates the coal sources and test sites involved in the Gaston testing.

Test Plan Implementation

The Pittsburg & Midway Coal Mining Company (P&M) provided coal mined at its North River No.1 Mine located near Berry, Alabama. The Pratt Seam coal was deep mined from the 42-in. to 51-in. thick seam. The Utley Seam coal was surfaced mined at P&M's nearby Meg Mine No. 5 and was actually a blend of four minor seams designated Utley A, B, C, and D. Each seam ranged in thickness from 12 to 18 inches. This coal is normally transported by truck to

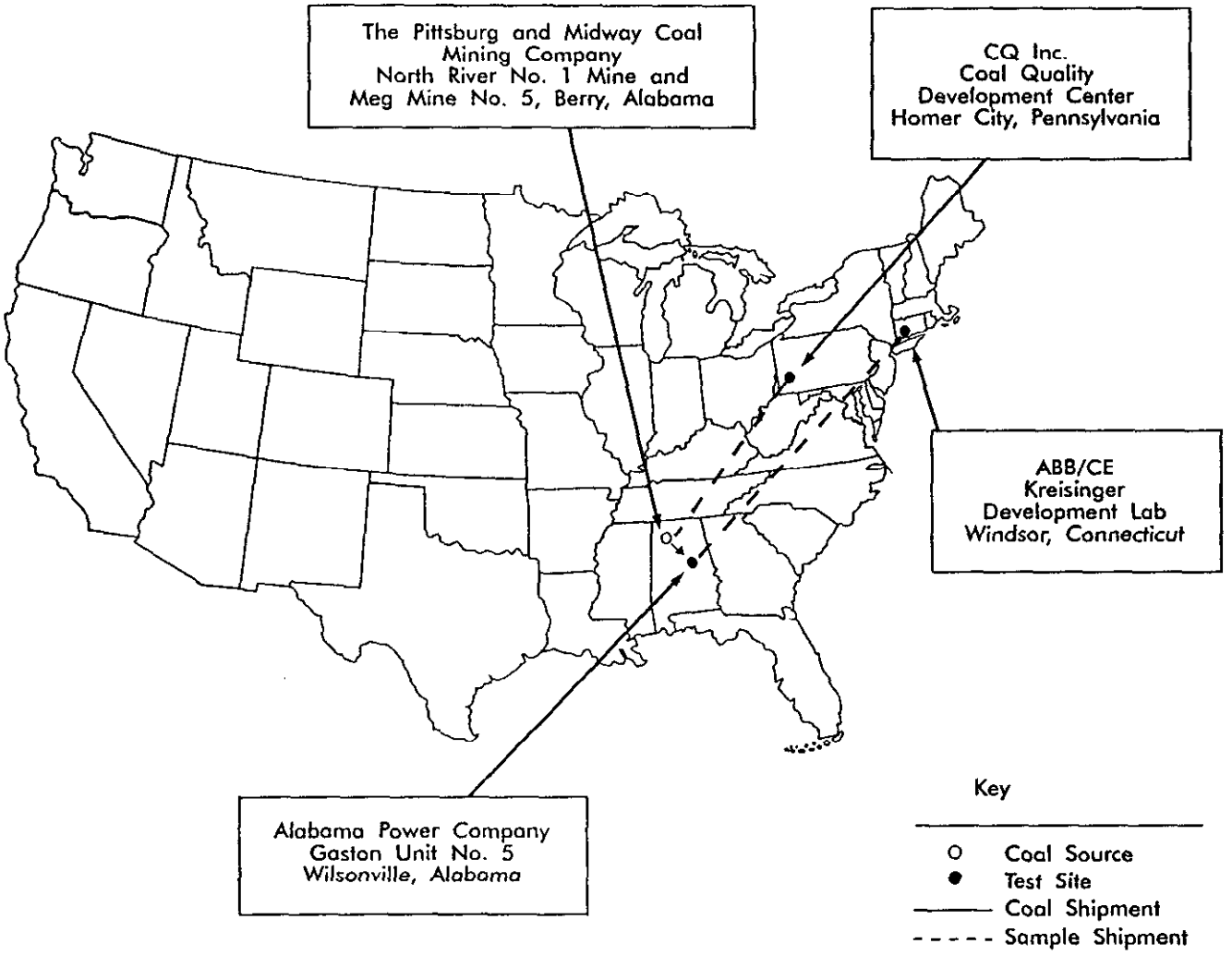


Figure 1. Coal Sources and Test Sites for Plant Gaston Unit 5 Testing

P&M's rail loadout facilities at the North River No. 1 mining complex.

Typically, the Utley Seam coal is shipped to Gaston raw, while the Pratt Seam coal is cleaned prior to shipment. According to P&M engineers, the cleaned coal is loaded first into the railcars and the raw coal is used to "top-off" each railcar, thus providing a blended product.

In early December 1991, four railcars carrying approximately 400 tons of raw Pratt Seam coal and one railcar containing nearly 100 tons of raw Utley Seam coal directly from the North River mine arrived at CQ Inc's Coal Quality Development Center (CQDC) in Homer City, Pennsylvania. In the following months, these coals underwent extensive flowsheet and laboratory testing.

Although Pratt Seam and Utley Seam coals had not previously been characterized at the CQDC, preliminary laboratory tests on the delivered coal and information provided by P&M engineers indicated that the two test coals would respond to physical cleaning techniques. Using this guidance, CQ Inc. engineers designed a comprehensive testing schedule to evaluate the properties of a Pratt and Utley Seam blend similar to that burned at the Gaston Station as well as the properties of the individual coals.

Of the flowsheet tests performed, each one was designed to produce a clean coal of varying quality, with at least one having a minimum 86 percent energy recovery. In order to achieve this goal, operating parameters and cleaning equipment selections within the different flowsheets were varied from test to test.

Coal Background Information

In 1991, Alabama Power Company purchased over 1.7 million tons of blended Pratt and Utley Seam coals from P&M's North River No. 1 Mine. Utley Seam coal represented approximately 340,000 tons of the total. The two coals shipped from the North River mine were over one third of the 5.1 million tons burned at the Gaston Steam Plant in 1991. Alabama Power Company purchased the remaining 3.4 million tons of coal for Gaston primarily from the spot market. The coals from the North River mine were chosen for the Coal Cleanability Characterization testing because they are the principal coals burned at the Gaston

Steam Plant. In addition to coal-related information provided by Alabama Power Company, data was also supplied by the Pittsburg and Midway Coal Mining Company, the 1991 Keystone Coal Industry Manual, and the Geological Survey of Alabama.

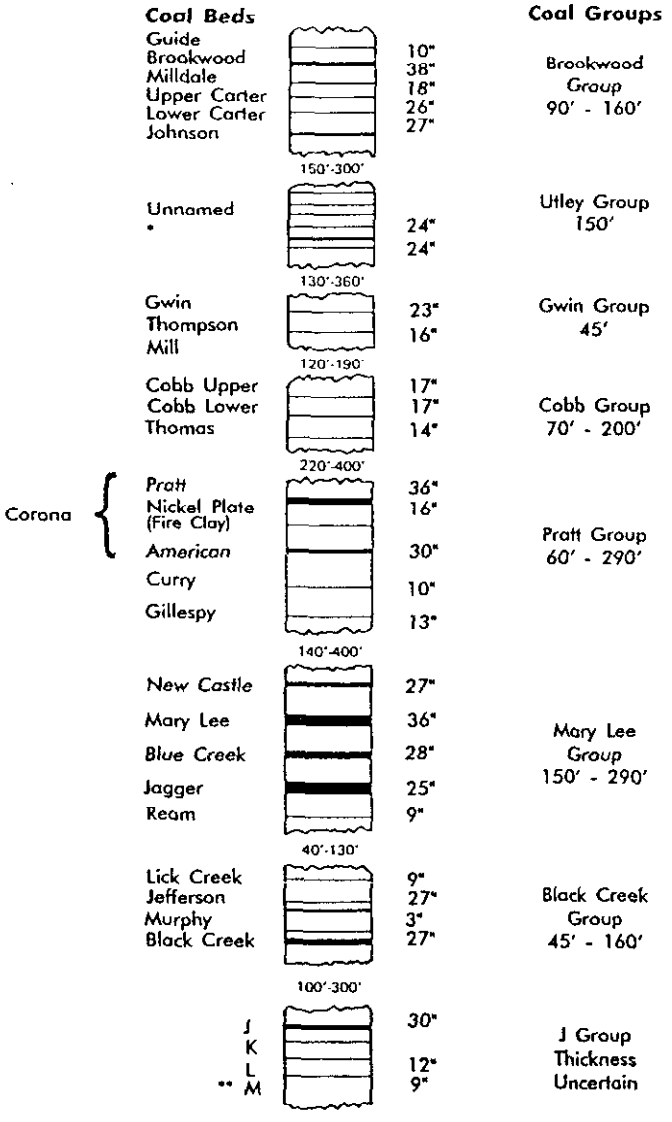
The Geological Survey of Alabama provided the stratigraphic columnar section in Figure 2 that shows the general location of the Pratt and Utley seams in relation to other seams in the same coal basin. According to Robert Barnett, geologist for the Geological Survey of Alabama, these coal seams occur only in Alabama and are part of the Warrior coal basin.

The Utley beds, traditionally called "Clement," are near the top of the stratigraphic interval of the basin and are only surface mined in Tuscaloosa, southeastern Fayette, and southern Jefferson counties. During fiscal year 1991, there were eight coal companies reporting 858,350 short tons of coal that was mined from 13 surface mines in the Utley group. This represents approximately three percent of the total coal production from Alabama. In 1990, the North River complex shipped 312,100 tons of Utley Seam coal. This tonnage, therefore, represents over 36 percent of the total statewide production from this seam.

Also according to Mr. Barnett, the seams in the Pratt group are in the lower stratigraphic section and have historically been both surface and underground mined. During fiscal year 1991, eight different coal companies mined about 4,409,300 short tons of Pratt group coal from 20 surface mines and one underground mine. This production represents about 16 percent of the coal produced in Alabama during 1991. The lone underground mine was the North River No. 1 Mine and its reported production was 1,812,900 short tons of coal. This was about 6.5 percent of the state's total coal production during 1991 and represents about 41 percent of the total statewide production for this seam.

Table 1, based on data compiled by the Geological Survey of Alabama, shows the demonstrated reserve base for the Pratt and Utley coal groups.

Table 2 shows typical as-received coal quality characteristics.



* The Clements coal bed, which probably occurs in the upper part of the Utley group, has been mined extensively in the Warrior coal basin. Its exact stratigraphic position, however, is unknown.

** *J group coal beds are probably equivalent to the Polecat, Bear* Creek, Buttahatchee, and Bull Mountain beds.

Source: Geological Survey of Alabama

Figure 2. Warrior Coal Basin. *General Columnar Section.*

Table 1. Pratt and Utley Coal Group Reserve Base. *(Million Short Tons).*

Alabama County	Pratt Coal Group	Utley Group*
Fayette	111.7	5.2
Jefferson	161.4	61.9
Tuscaloosa	307.3	199
Walker	90.9	3.3

* Utley Group figures are combined with those of the Gwin Group to ensure positive identification of coal beds.

Table 2. Typical As-Received Analyses for Pratt and Utley Seam Coals

Seam Name	Moisture (Wt %)	Ash (Wt %)	Sulfur (Wt %)	Heating Value (Btu/lb)
Pratt	2.5	8.4	1.9	13,406
Utley	1.4	8.2	1.8	13,833

Source: 1991 Keystone Coal Industry Manual

The North River No. 1 Mine, which deep mines the Pratt Seam, was designed to produce 8,500 tons per day of raw coal. Miners enter the mine by way of a shaft, and the coal exits the mine up a slope. There is 510 feet of cover over the seam at the portal. The mining operation uses two continuous miners and one longwall miner. Typically the coal from the mine is crushed to 3-in. x 0 topsize before it is cleaned in P&M's McNally Pittsburg jig plant. This plant's principal cleaning devices are a Baum jig and froth flotation cells; the plant has an operating capacity of 15,000 tons per day.

RAW COAL CHARACTERISTICS

In December 1991, approximately 400 tons of Pratt raw coal and 100 tons of Utley raw coal were shipped to CQ Inc.'s Coal Quality Development Center (CQDC) in western Pennsylvania. Engineers at the North River Mine complex reported that heavy rains occurred prior to and during shipment loading. Also the uncovered rail shipment was subjected to torrential downpours and then sub-freezing temperatures and high winds prior to unloading at the CQDC. The coal arrived at the CQDC's receiving station frozen inside the railcars and caused considerable handling problems during unloading and throughout the subsequent test program.

The frozen raw coal shipment caused considerable problems during unloading.

During unloading, six-ton samples of each coal were collected at the CQDC's primary sampler as each was received. These samples were sent to the laboratory where they were split into one-ton subsamples, which were used for raw-coal characterization tests. The laboratory performed the following tests on the raw coals:

- Screen Analysis
- Washability Analysis
- Head Analysis
- Trace Element Analysis

Summaries of the raw coal laboratory data are given in Table 3. Detailed laboratory specifications and raw coal data are given in Appendix A. Analyses from these tests allow general statements to be made about the quality of the raw coals. They also allow evaluation of cleaning scenarios other than those tested at commercial scale.

Pratt Seam Raw Coal Characteristics

The raw Pratt Seam coal had a total moisture content of 6.64 percent and the following general characteristics, reported on a dry, weight percent basis:

• Ash (Wt %)	25.86
• Volatile Matter (Wt %)	31.51
• Fixed Carbon (Wt %)	42.63
• Total Sulfur (Wt %)	2.13
• Pyritic Sulfur (Wt %)	1.10

Table 3. Raw-Coal Quality Summary. *Pratt Seam Coal (Dry Basis).*

PROXIMATE ANALYSIS	
Total Moisture (Wt %)	6.64
Ash (Wt %)	25.86
Volatile Matter (Wt %)	31.51
Fixed Carbon (Wt %)	42.63
Heating Value (Btu/lb)	10,777
Sulfur	
Total (Wt %)	2.13
Pyritic (Wt %)	1.10
Pyritic/Total (%)	52
SO_2 (lb/MBtu)	3.95
Ash (lb/MBtu)	23.99
Hardgrove Grindability (HGI)	62
Chlorine (Wt %)	0.08
LiO_2 (ppm)	209.91
ULTIMATE ANALYSIS	
Carbon (Wt %)	59.55
Hydrogen (Wt %)	4.89
Nitrogen (Wt %)	1.36
Sulfur (Wt %)	2.13
Ash (Wt %)	25.86
Oxygen (Wt %)	6.71
SIZE DISTRIBUTION (Wt %)	
+1 1/2-in.	11.82
1 1/2-in. x 3/4-in.	24.31
3/4-in x 3/8-in.	19.41
3/8-in. x 28M	30.93
28M x 100M	3.69
100M x 325M	2.31
325M x 0	7.54

Table 3. Raw-Coal Quality Summary (Continued). *Pratt Seam Coal (Dry Basis).*

ASH FUSIBILITY (° F) (Reducing/Oxidizing)	
Initial Deformation	2450/2580
Softening	2505/2610
Hemispherical	2550/2665
Fluid	2605/2710
ASH COMPOSITION (Wt %)	
SiO_2	49.36
Al_2O_3	25.93
Fe_2O_3	10.25
CaO	4.15
MgO	1.93
Na_2O	0.52
K_2O	2.51
TiO_2	1.65
MnO_2	328.41*
P_2O_5	0.08
SO_3	1.43
Ash Type	Eastern
Slagging Index	0.54 (low)
Fouling Index	0.13 (low)

* Denotes ppm

The Pratt raw coal had a calculated moist, mineral matter-free Btu value of 13,683, which according to ASTM classifications places it in the high volatile A bituminous class.

Size Analysis

Raw coal size data are summarized in Table 4 and detailed raw coal size data are in Appendix A. This information shows that the largest (plus 1 1/2-in.) and the smallest size fraction (minus 325 mesh) contain the highest percentages of ash and the lowest sulfur contents. However, little beneficiation of this coal, in terms of ash and sulfur reductions, can be expected by sizing alone. For example, removing the plus 1 1/2-in. and the minus 325 mesh size fraction during cleaning would reduce the ash content of the coal from 25.9 percent to 22.4 percent but the sulfur content would increase from 2.13 percent to 2.34 percent. This would cause the SO_2 emissions potential to increase from 3.95 lbs SO_2/MBtu to 4.12 lbs SO_2/MBtu.

Table 4. As-Received Raw Coal Size Data. *Pratt Seam Coal.*

Size Passed	Size Retained	Wt %	Ash	Sulfur	Cumulative Ash
	1 1/2-in.	11.82	37.78	1.81	37.78
1 1/2-in.	3/4-in.	24.31	26.38	2.22	30.11
3/4-in.	3/8-in.	19.41	20.86	2.45	26.88
3/8-in.	28 mesh	30.93	20.76	2.37	24.69
28 mesh	100 mesh	3.69	18.27	2.09	24.43
100 mesh	325 mesh	2.31	22.72	2.52	24.38
325 mesh		7.54	49.81	1.25	26.30

Utley Seam Raw Coal Characteristics

As shown in Table 5, the raw Utley coal had a total moisture content of 6.71 percent and the following general characteristics, reported on a dry weight percent basis:

- Ash (Wt %) 15.27
- Volatile Matter (Wt %) 36.38
- Fixed Carbon (Wt %) 48.35

- Total Sulfur (Wt %) 3.81
- Pyritic Sulfur (Wt %) 2.16

The as-received Utley raw coal had a calculated moist, mineral matter-free Btu value of 13,999 which, according to ASTM classifications, places it in the high volatile A bituminous coal class.

Size Analysis

As-received raw coal size data are summarized in Table 6 and detailed raw coal size data are in Appendix B. This information shows that the smallest size fraction (minus 325 mesh) contains the highest percentage of ash and a relatively low sulfur content. The size data indicates that some beneficiation in ash reduction is possible by sizing alone. If the minus 325 mesh were to be removed from this raw coal, the ash content would be reduced by over 24 percent as it would be lowered from 15.27 percent to 11.54 percent. Also, removing this size fraction would lower the SO_2 emissions potential from 6.04 lbs SO_2/MBtu to 5.40 lbs SO_2/MBtu or 10.6 percent.

Table 5. Raw Coal Qua

PROXIMATE ANALYSIS
Total Moisture (Wt %)
Ash (Wt %)
Volatile Matter (Wt %)
Fixed Carbon (Wt %)

Table 5. Raw Coal Quality Summary (Continued). *Utley Seam Coal (Dry Basis).*

ASH FUSIBILITY (°F) (Reducing/Oxidizing)	
Initial Deformation	1995/2440
Softening	2080/2490
Hemispherical	2200/2515
Fluid	2315/2540
ASH COMPOSITION (Wt %)	
SiO_2	46.25
Al_2O_3	20.02
Fe_2O_3	25.19
CaO	4.14
MgO	1.34
Na_2O	.24
K_2O	2.10
TiO_2	0.74
MnO_2	585.5*
P_2O_5	0.28
SO_3	1.84
Ash Type	Eastern
Slagging Index	1.88 (Medium)
Fouling Index	0.12 (low)

* Denotes ppm

Table 6. As-Received Raw Coal Size Data. *Utley Seam Coal.*

Size Passed	Size Retained	Wt %	Ash	Sulfur	Cumulative Ash
	1 1/2-in.	5.61	13.63	3.07	13.63
1 1/2-in.	3/4-in.	28.34	9.12	3.50	9.86
3/4-in.	3/8-in.	20.38	9.14	3.75	9.59
3/8-in.	28 mesh	32.37	12.55	3.65	10.70
28 mesh	100 mesh	4.21	21.58	3.55	11.19
100 mesh	325 mesh	2.13	26.36	3.29	11.54
325 mesh		7.05	60.14	1.50	14.97

RAW COAL COMPARISONS

In comparing the raw Pratt and Utley Seam coals, CQ Inc. engineers found that the two coals have differences in certain constituents. For example, the Pratt Seam coal has considerably higher ash (25.86 percent) compared to the Utley Seam (12.12 percent) while the Utley Seam has over 1.78 times more total sulfur than the Pratt Seam coal. Another major difference between the two coals is the higher ash fusibility temperatures of the Pratt versus the Utley. In all fusibility cases the Pratt coal produced from 11 percent to 19 percent higher fusion temperatures in a reducing atmosphere and from 5 to 6 percent higher temperatures in an oxidizing atmosphere. The lower ash fusion temperatures of the Utley Seam coal can possibly be attributed to a higher ferric oxide content of 25.19 percent compared to 10.25 percent for the Pratt Seam coal.

Also notable is the distribution of sulfur within the raw coals. A close look at the as-received raw coal size data shows that the sulfur in the Utley Seam coal is fairly consistent throughout the plus 1 1/2-in. x 325 mesh size fractions, with the 325 mesh x 0 size fraction containing the lowest sulfur. In contrast, the Pratt Seam has less sulfur in the plus 3/4-in. and 325 mesh x 0 size fractions and, as mentioned earlier, a lower overall sulfur content than the Utley Seam coal.

LIBERATION POTENTIAL

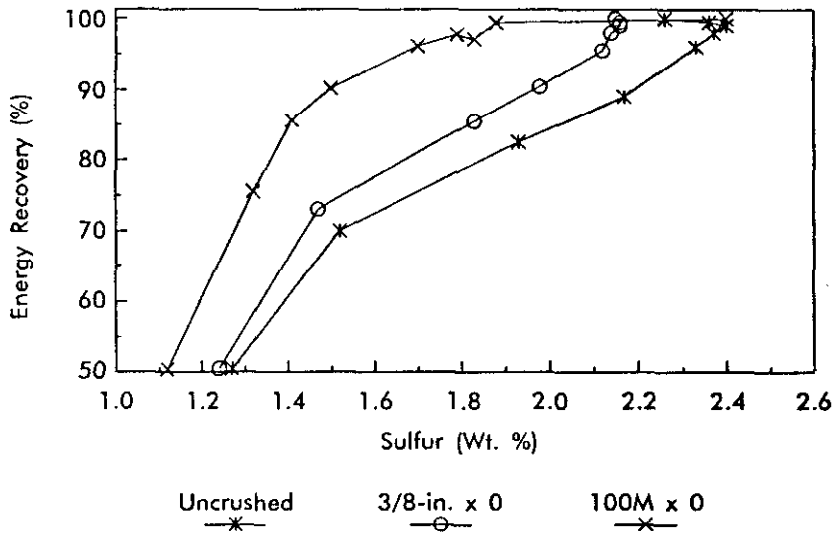
Physical coal cleaning processes can separate only physically discrete particles. If a single particle is composed of 50 percent coal and 50 percent mineral matter, the mineral matter must be accepted as part of the clean coal or part of the refuse. Crushing the particle to produce a number of smaller particles can change the relative composition of the new particles. If complete liberation occurs, each new particle will be composed of pure coal or pure mineral matter. However, it is not currently cost effective to crush or grind any coal fine enough for complete liberation. But increasing the degree of liberation can increase the amount of heating value recovered from the raw coal during the cleaning process, thereby reducing overall coal cleaning costs. Detailed raw coal liberation data are found in Appendices C and D.

This investigation quantified the impact of progressive crushing on the Pratt and Utley Seam coals. In this study, various subsamples of the raw coal were crushed to topsizes of 3/8-in. and 100 mesh. Each subsample was then subjected to washability analyses and compared to its respective raw coal.

Pratt Seam Coal

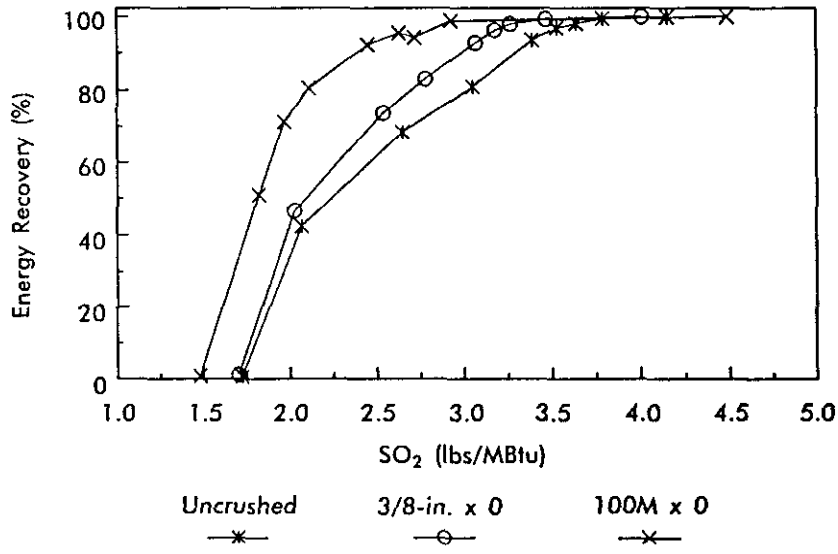
Figures 3, 4, and 5 depict the composite washability of all size fractions of the uncrushed Pratt Seam coal and the same coal crushed to two different topsizes. Figure 3 shows that progressive crushing liberates sulfur, indicating that a cleaned coal lower in sulfur than the raw coal can be produced without significantly affecting energy recoveries. Sulfur removal in conjunction with the higher heating values produced by cleaning will lower the SO_2 emissions during combustion, as indicated in Figure 4. However, as Figure 5 shows, extensive crushing to a topsize of at least 100 mesh and cleaning at a specific gravity at or below 1.8 will be required to produce a coal with an SO_2 emissions potential within the 1990 Clean Air Act Amendments Phase I compliance requirement of 2.5 lbs SO_2/MBtu. Because of the high costs typically associated with extensive grinding, it is unlikely that the crushing and cleaning required to produce a compliance coal will be economical for the Pratt raw coal.

As for the ash content, illustrated in Figure 6, crushing before cleaning can produce significant reductions in ash-forming mineral matter. As shown, crushing to either a



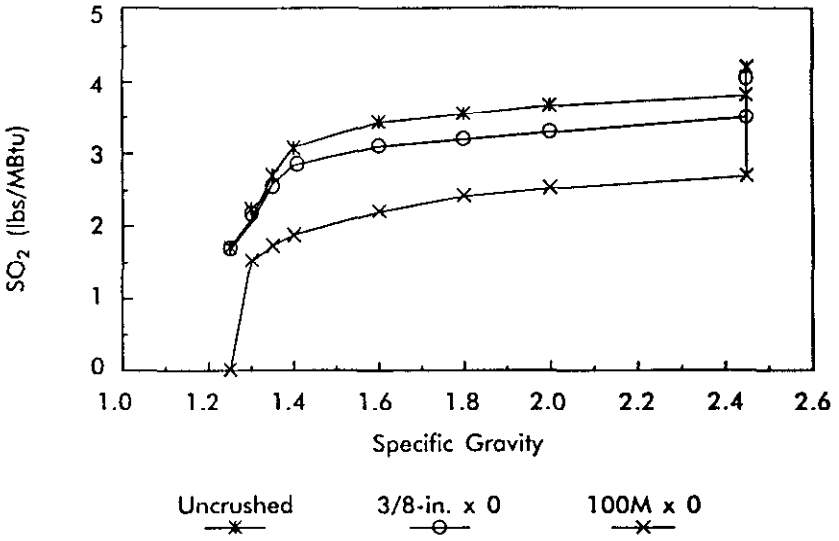
Note: Process Tech Cesium Chloride Solution

Figure 3. Raw Coal Liberation. *Sulfur Liberation Potential, Pratt Seam Coal.*



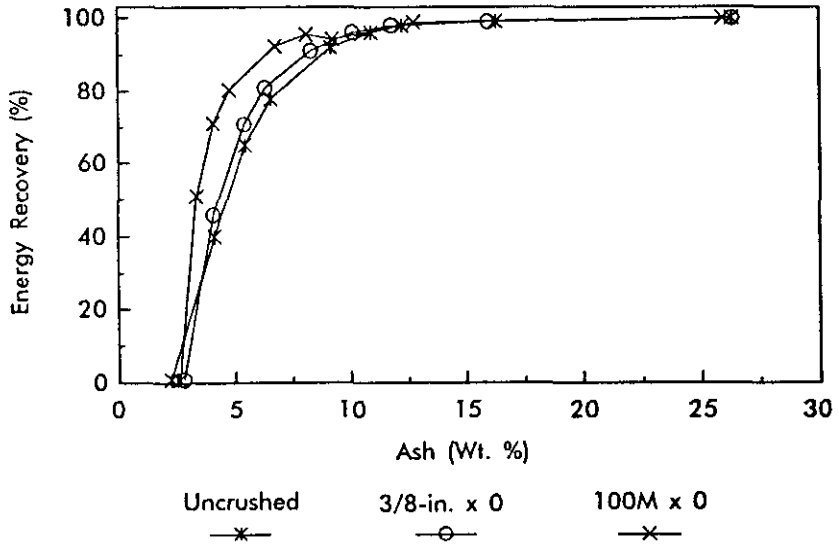
Note: Process Tech Cesium Chloride Solution

Figure 4. Raw Coal Liberation. *SO_2 Liberation Potential, Pratt Seam Coal.*



Note: Process Tech Cesium Chloride Solution

Figure 5. Raw Coal Liberation. *SO_2 Cleaning Potential, Pratt Seam Coal.*



Note: Process Tech Cesium Chloride Solution

Figure 6. Raw Coal Liberation. *Ash Liberation Potential, Pratt Seam Coal.*

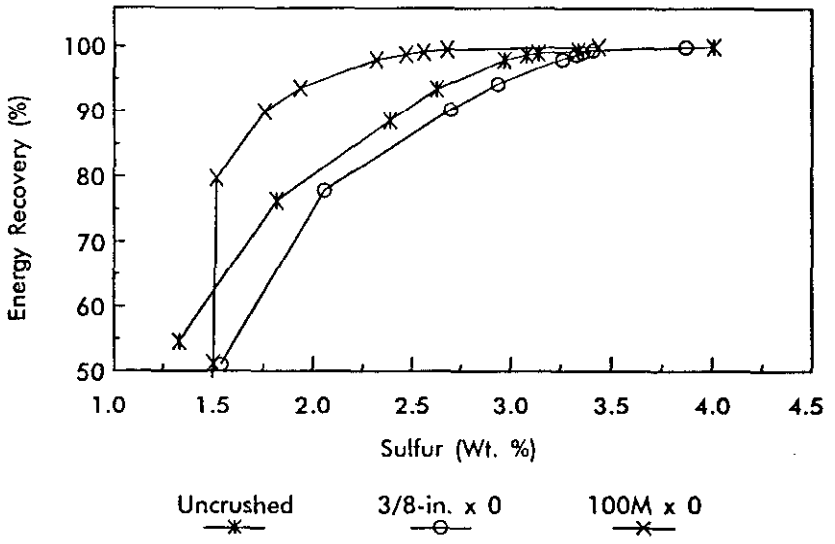
3/8-in. or 100 mesh topsize can reduce the total ash content from over 25 percent to as low as about seven percent without a significant energy loss. Not only will this ash reduction be beneficial from the ash disposal and coal transportation standpoints, but will also contribute to the overall reduction of certain trace elements associated with the mineral matter in the ash. Many of these trace elements can contribute to air toxics emissions, and in the future, might be regulated under Title III of the 1990 Clean Air Act Amendments.

Utley Seam Coal

The liberation studies show somewhat similar relationships between the Utley and Pratt Seam coals. As Figures 8 and 9 indicate, crushing also reduces sulfur and the resulting SO_2 emissions potential for the Utley raw coal. Notice that in Figures 7 and 8 there are discrepancies in the sulfur and SO_2 liberation potentials reported for the 3/8-in. x 0 size fraction. This is attributed to laboratory error as it can be expected that crushing would liberate more sulfur particles compared to the uncrushed coal, as is the case illustrated by the 100 mesh x 0 size fraction.

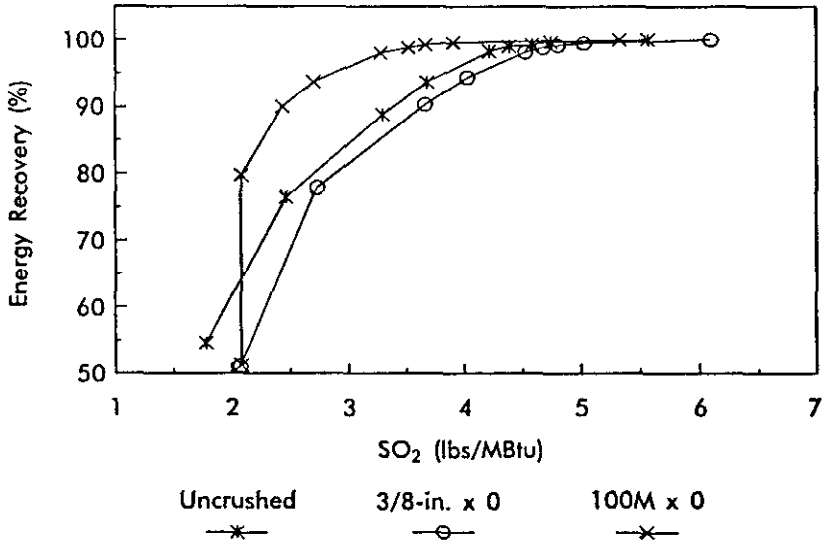
Since considerable sulfur can be liberated by crushing, Figure 9 shows that present conventional coal cleaning techniques can probably produce a coal low enough in sulfur to reach Phase I compliance levels. However, because the Pittsburg and Midway Coal Mining Company ships this coal as part of a blend, crushing and cleaning should help reduce the overall sulfur and ash content of the marketed product.

As shown in Figure 10, crushing can also significantly improve the potential for reductions in the ash-forming mineral matter for the Utley Seam, from around 15 percent to around five percent without a severe energy penalty. Again, ash reductions of this magnitude not only will lower ash disposal and coal transportation costs, but can also reduce the amounts of toxic emissions producing trace elements that would normally enter Plant Gaston Unit No. 5.



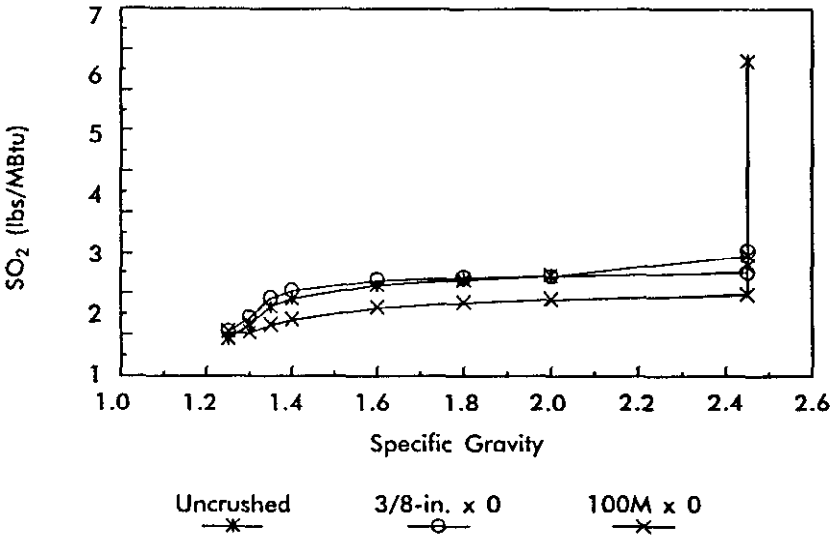
Note: Process Tech Cesium Chloride Solution

Figure 7. Raw Coal Liberation. *Sulfur Liberation Potential, Utley Seam Coal.*



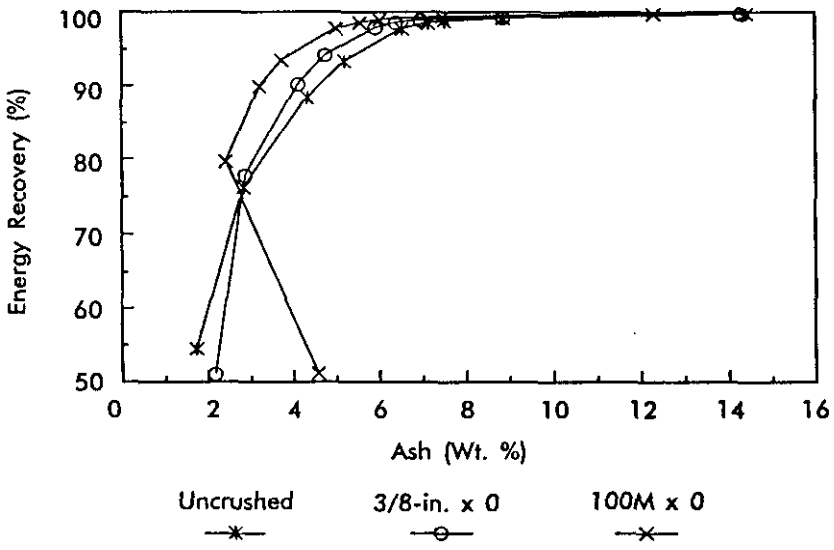
Note: Process Tech Cesium Chloride Solution

Figure 8. Raw Coal Liberation. *SO_2 Liberation Potential, Utley Seam Coal.*



Note: Process Tech Cesium Chloride Solution

Figure 9. Raw Coal Liberation. *SO_2 Cleaning Potential, Utley Seam Coal.*



Note: Process Tech Cesium Chloride Solution

Figure 10. Raw Coal Liberation. *Ash Liberation Potential, Utley Seam Coal.*

WASHABILITY STUDIES

A washability analysis is a laboratory float/sink test in which a sized sample of coal is placed in a series of liquids of known specific gravity. These liquids are used to partition the coal sample into a series of specific gravity fractions. Coal particles, which are relatively light, float; mineral particles, which are denser than coal, sink. These laboratory separations or washability studies are used to theoretically determine the most profitable way to clean a particular coal as well as evaluate the types of equipment to use in cleaning. The degree to which these laboratory results directly reflect the performance of commercial coal cleaning equipment depends on the equipment used, methods of operation, clean coal quality desired, and raw coal characteristics.

Raw coal liberation data can be used in washability studies to determine the degree of cleaning possible. One of the uses of cumulative float data is the evaluation of the percentage of near gravity material (the amount of feed material within plus or minus 0.1 specific gravity unit of the specific gravity of separation) in the coal. These evaluations help predict the difficulty that might be expected when making separations at certain specific gravities.

Percent Near-Gravity Particles	Difficulty in Separation
0-7	Simple
7-10	Moderately Difficult
12-15	Difficult
15-20	Very Difficult
20-25	Exceedingly Difficult
Above 25	Formidable

Raw coal liberation data are also used to help determine operating parameters of cleaning processes and equipment.

Pratt Seam Coal

Table 7 illustrates the cumulative float-sink data from the liberation studies performed on the Pratt Seam coal. From these data it was concluded that separations at specific gravities above 1.65 would be simple, whereas those between 1.50 and 1.60 would be moderately difficult and those from 1.45 down would be difficult to formidable.

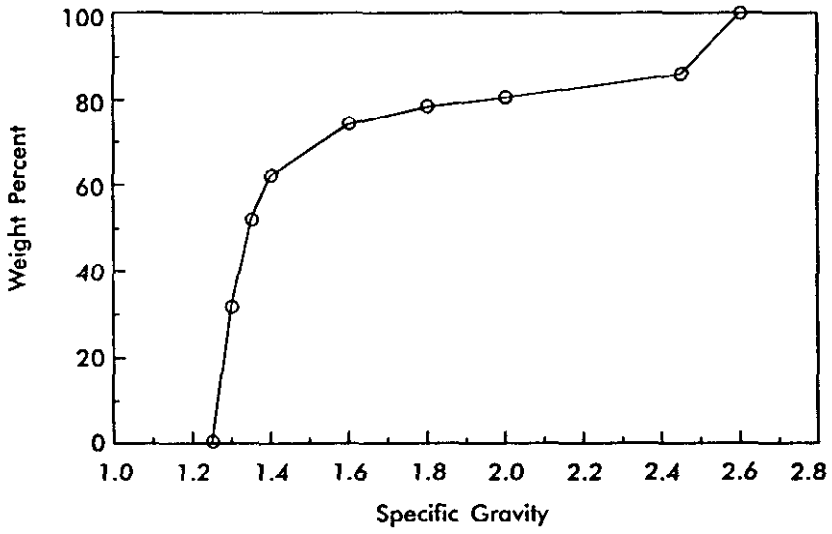
Table 7. Pratt Seam Cumulative Float-Sink

Sink	Float	Wt (%)
	1.250	0.40
1.250	1.300	31.74
1.300	1.350	51.92
1.350	1.400	62.14
1.400	1.450	65.16*
1.450	1.500	68.18*
1.500	1.550	71.20*
1.550	1.600	74.21
1.600	1.650	75.25*
1.650	1.700	76.29*
1.700	1.800	78.37
1.800	2.000	80.45
2.000	2.450	85.85
2.450		100.00

* Interpolated values

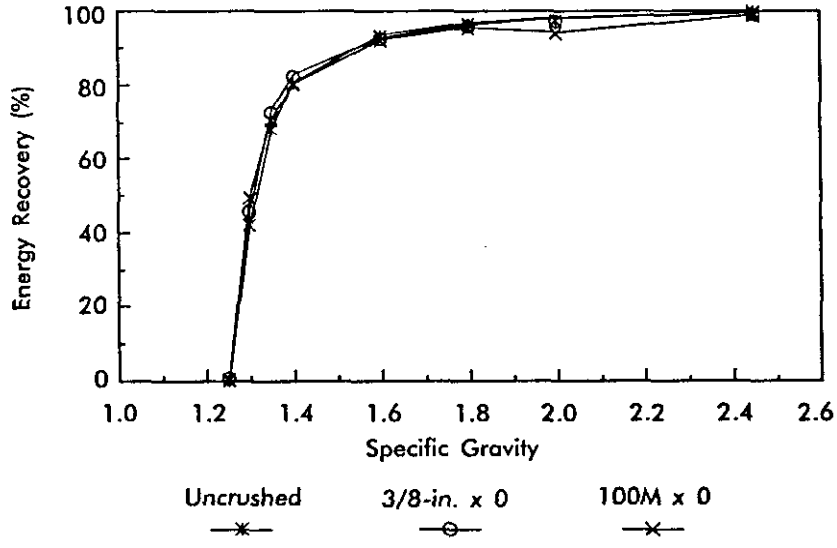
The above data were used to construct the theoretical yield curve shown in Figure 11. Line graphs such as these provide general information concerning the operation of the equipment used to clean this coal. The "knee" of the curve generally represents the economic limit for quality improvement through cleaning because the relationship between yield and quality deteriorates below this point. Using this criterion, cleaning Pratt coal below a specific gravity of approximately 1.6 is not likely to be economical. However, even at this specific gravity, because of the high ash content of this coal, theoretical plant yield will be around 75 percent at best.

Another line graph, shown in Figure 12, indicates the approximate specific gravity where separations should occur to produce a desired energy recovery. One of the coal cleaning specifications for this program was to produce cleaned coals with a minimum of 86 percent energy recovery. The graph shows that any gravity separation above 1.50 should theoretically produce the desired energy recovery.



Note: Process Tech Cesium Chloride Solution

Figure 11. Raw Coal Liberation. *Theoretical Yield, Pratt Seam Coal.*



Note: Process Tech Cesium Chloride Solution

Figure 12. Raw Coal Liberation. *Theoretical Energy Recovery, Pratt Seam Coal.*

Utley Seam Coal

Table 8 illustrates the cumulative float-sink data from the liberation studies performed on the Utley Seam coal. From these data it was concluded that separations at specific gravities above 1.50 would be simple, whereas those around 1.45 would be very difficult and those from 1.40 down would be formidable.

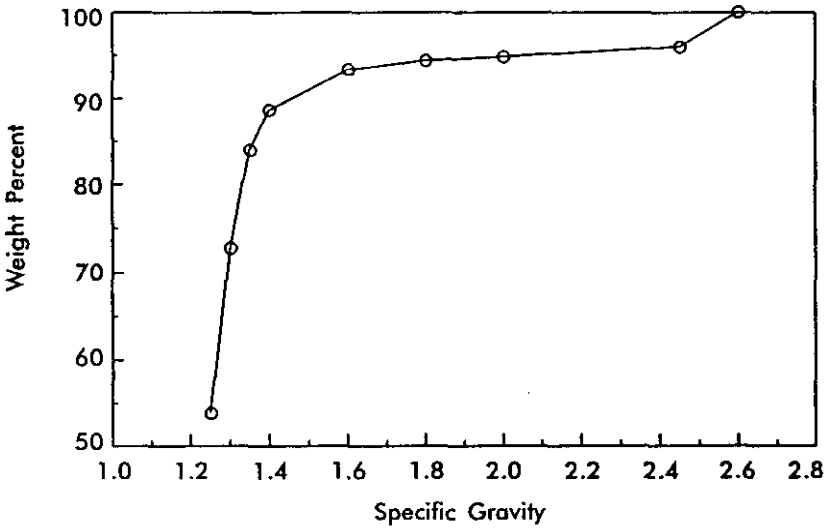
Table 8. Utley Seam Cumulative Float-Sink

Sink	Float	Wt (%)
	1.250	7.78
1.250	1.300	45.70
1.300	1.350	68.07
1.350	1.400	77.59
1.400	1.450	79.94*
1.450	1.500	82.28*
1.500	1.550	84.62*
1.550	1.600	86.96
1.600	1.700	88.01*
1.700	1.800	89.05
1.800	2.000	89.97
2.000	2.450	92.27
2.450		100.00

* Interpolated values

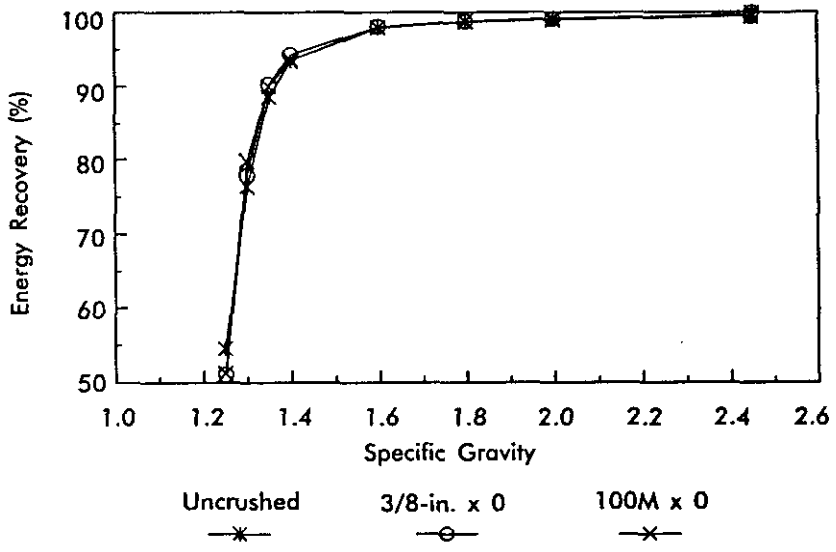
The above data were used to construct the theoretical yield curve shown in Figure 13. The knee of the curve shows that Utley Seam coal can be cleaned near the same 1.6 specific gravity shown above for the Pratt Seam. However, unlike the Pratt, cleaning near this specific gravity will not adversely affect plant yield. As shown, cleaning at 1.6 will theoretically produce a plant yield near 87 percent.

Also, Figure 14 indicates that cleaning at a 1.6 specific gravity should produce a clean coal product that recovers around 95 percent of the energy available in the raw coal.



Note: Process Tech Cesium Chloride Solution

Figure 13. Raw Coal Liberation. *Theoretical Yield, Utley Seam Coal.*



Note: Process Tech Cesium Chloride Solution

Figure 14. Raw Coal Liberation. *Theoretical Energy Recovery, Utley Seam Coal.*

In summary, the analysis of the raw coal data indicated that both the Pratt and Utley Seam coals could be physically cleaned to produce improved quality coals. However, the data also shows that both seams contain high amounts of sulfur and ash-bearing mineral matter. While it would be relatively easy to physically remove large amounts of the ash-bearing mineral matter, thus improving the quality of these coals, liberating and removing the sulfur would require extensive crushing. Even with crushing, it is unlikely that enough sulfur can be removed by conventional coal cleaning to produce Phase I compliance (2.5 lb SO_2/MBtu) fuel from the Pratt Seam coal. Also, the raw coal data shows that producing a coal with the minimum 86 percent energy recovery required by this project would be a formidable task.

However, this study also shows that although it may not be desirable for the Pittsburg and Midway Coal Mining Company to clean Utley Seam coal at the present time, cleaning may be a logical part of future emission or toxic control programs or to increase thermal efficiency. With increased thermal efficiency, these two cleaned coals or a blend could be used along with other low sulfur reserves to meet Phase I compliance if economically feasible.

COAL CLEANING EVALUATION

Both the Pratt and Utley Seam coals were cleaned in the commercial-scale cleaning plant at the CQDC. Because Alabama Power Company was burning a blend of cleaned Pratt Seam coal and raw Utley Seam coal at the time of testing, CQ Inc. engineers devised four flowsheet configurations to evaluate the practical cleanability of both coals. Each coal was evaluated separately using a common flowsheet design intended to represent a low-cost cleaning option. Also, because Alabama Power Company burns a blend of cleaned Pratt and raw Utley coals, CQ Inc. tested a blend of these coals using a flowsheet configuration intended to simulate conventional cleaning of the two raw coals blended before cleaning. Finally, Pratt Seam coal was cleaned alone using another low-cost flowsheet specifically designed to remove sulfur-bearing minerals.

Flowsheet 1, which evaluated a blend of 90 percent Pratt and 10 percent Utley Seam coal, utilized three main separating devices: heavy-media cyclones (HMC), water-only cyclones (WOC), and froth flotation cells (FF). It was thought that this flowsheet would produce the cleanest product possible from this coal blend. This blend ratio was chosen because the mining company was shipping a blend of 80 percent clean Pratt Seam coal and 20 percent raw Utley Seam coal to the Gaston Steam Plant.

Minimum cleaning was demonstrated using a Deister concentrating table for each individual coal in Flowsheets 2 and 3. Flowsheet 2 was used to clean Pratt Seam coal and Flowsheet 3 was used for Utley Seam coal.

Finally, in Flowsheet 4, Pratt Seam coal was cleaned using the Deister concentrating table, and a spiral separator. It was hoped that the spiral would remove additional fine sulfur particles, thus lowering the overall sulfur content of the clean coal product.

In each case the coal was crushed to a nominal topsize of 3/8-in. to facilitate ash and sulfur liberation. Following a series of set-up tests, the flowsheet tests were conducted. Components of these flowsheets are summarized in Table 9.

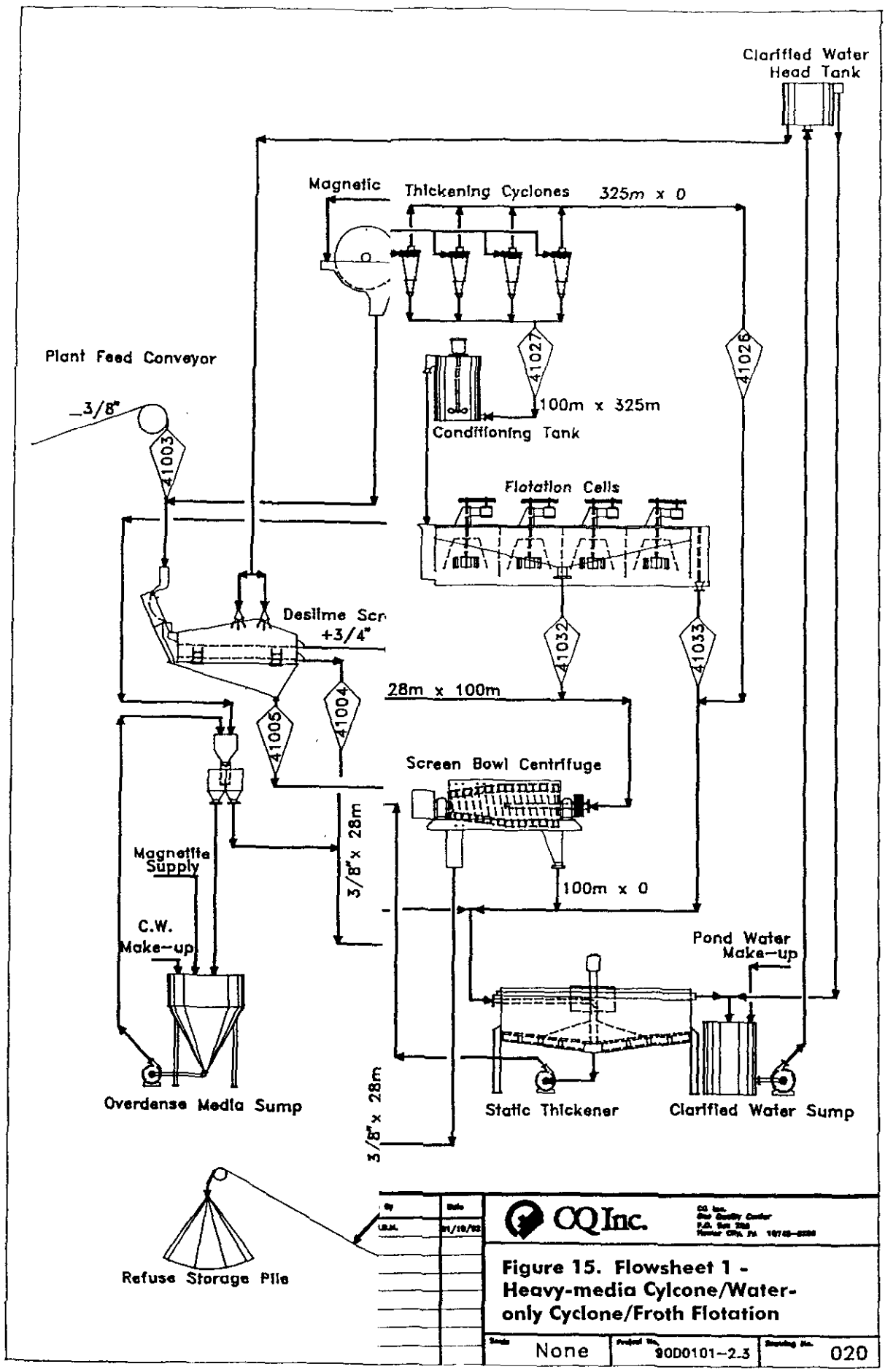
Table 9. Gaston Cleanability Flowsheet Configurations

Test No.	CQ Inc. Run No.	Plant Feed	Feed Size to Cleaning Device: HMC	WOC	FF	Table	Spiral	HMC S.G.
1	91121901	Crushed 3/8"x0	3/8"x28M	28Mx0	100Mx325M	NA	NA	1.60
2	91122701	Crushed 3/8"x0	NA	NA	NA	3/8"x100M	NA	NA
3	91122702	Crushed 3/8"x0	NA	NA	NA	3/8"x100M	NA	NA
4	92010601	Crushed 3/8"x0	NA	NA		3/8"x28M	28Mx325M	NA

Legend
HMC - Heavy-media Cyclone
WOC - Water-only Cyclone
FF - Froth Flotation
S.G. - Specific Gravity

Figure 15 shows the heavy-media cyclone/water-only cyclone/froth flotation flowsheet used for the Flowsheet 1 test. The run-of-mine coal was crushed to 3/8-in. topsize and fed to the plant at a rate of nine tons per hour of the Pratt Seam coal and one ton per hour of the Utley Seam coal. The raw coal blend was fed to a double-deck, raw-coal deslime screen; the screen's top deck scalped off coal larger than 3/8-in., and the bottom deck was fitted with 0.5 mm profile wire, resulting in a 28 mesh separation. The 3/8-in. x 28 mesh coal was mixed with a heavy-medium suspension of finely-ground magnetite in water and pumped to a 14-in.-diameter Roberts & Schaefer heavy-media cyclone. Both the heavy media cyclone clean coal and refuse products were drained and rinsed of medium on a combination of sieve bends and vibrating screens, and dewatered in separate basket centrifuges.

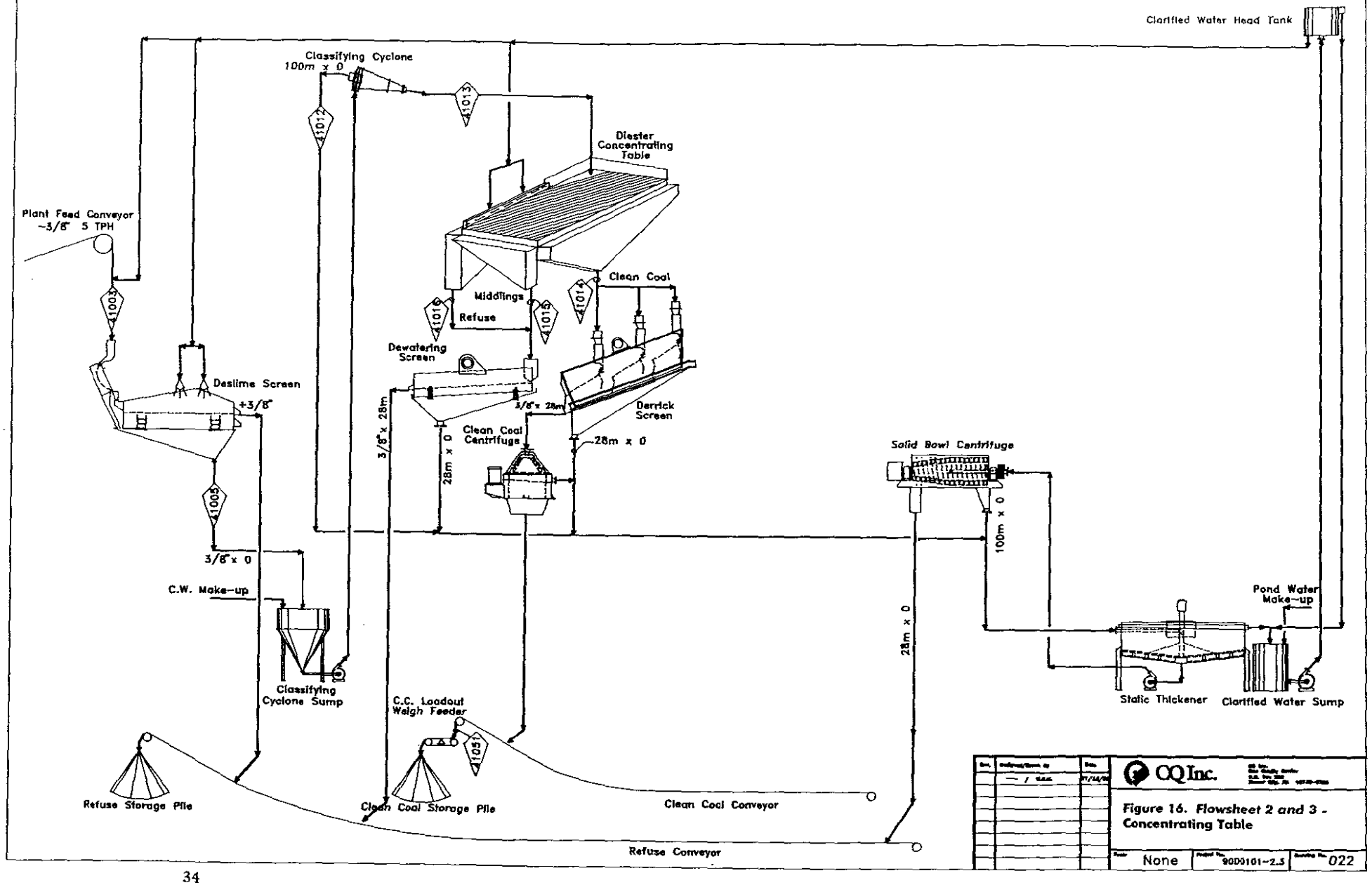
The 28 mesh x 0 raw coal (deslimed screen underflow) was slurried and cleaned in a two-stage, middlings recirculation, water-only cyclone circuit consisting of a Krebs 10-in.-diameter primary cyclone and a Krebs 6-in.-diameter secondary cyclone. The 28 mesh x 0 primary water-only cyclone overflow was sized at 100 mesh by a VariSieve fine coal sieve bend, with the 28 mesh x 100 mesh clean-coal product dewatered by a screen-bowl centrifuge and the 100


Clarified Water Head Tank
Magnetic
Thickening Cyclones
325m x 0
Plant Feed Conveyor
-3/8"
41003
41027
41026
100m x 325m
Conditioning Tank
Flotation Cells
Desilme Scr
+3/4"
41032
41033
28m x 100m
41004
41005
Screen Bowl Centrifuge
3/8" x 28m
Magnetite Supply
100m x 0
C.W. Make-up
Pond Water Make-up
Overdense Media Sump
Static Thickener
Clarified Water Sump
3/8" x 28m
Refuse Storage Pile
CQ Inc.
Figure 15. Flowsheet 1 - Heavy-media Cylcone/Water-only Cyclone/Froth Flotation
None
90D0101-2.3
020

mesh x 0 underflow routed to a froth flotation sump. This material was pumped from the flotation sump to a bank of seven 4-in.-diameter thickening cyclones and classified at a nominal size of 325 mesh. The 100 mesh x 325 mesh material was conditioned with frother and collector, and fed to two banks of four 21-cubic foot WEMCO froth flotation cells. The clean coal concentrate was dewatered in a screen-bowl centrifuge and then discharged onto the clean coal conveyor, along with the 28 mesh x 100 mesh primary water-only cyclone overflow and 3/4-in. x 28 mesh heavy-media cyclone overflow products. The froth tailings, thickening cyclone overflow, and secondary water-only cyclone underflow were thickened in a static thickener and then dewatered by a solid-bowl centrifuge. These refuse materials were subsequently discharged onto the refuse conveyor, along with the dewatered heavy-media cyclone reject material.

Figure 16 shows the concentrating table flowsheet used for the Flowsheet 2 and 3 tests. In Flowsheet 2, the run-of-mine Pratt Seam coal was crushed to 3/8-in. topsize and fed to the plant at a rate of five tons per hour. The raw coal was fed to a double-deck, raw-coal deslime screen; the screen's top deck scalped off coal larger than 3/8-in., and the bottom deck was removed so that the remaining 3/8-in x 0 coal could be pumped to the classifying cyclone. The classifying cyclone made a 100 mesh cut, sending the 100 mesh x 0 refuse size fraction to the static thickener. The plus 100 mesh coal was fed to the concentrating table. The middlings stream from the table was discarded along with the refuse. The clean coal was directed to a centrifuge for dewatering. Flowsheet 3 was configured the same as Flowsheet 2 in order to compare Utley Seam coal cleanability and Pratt Seam coal cleanability on a head-to-head basis.

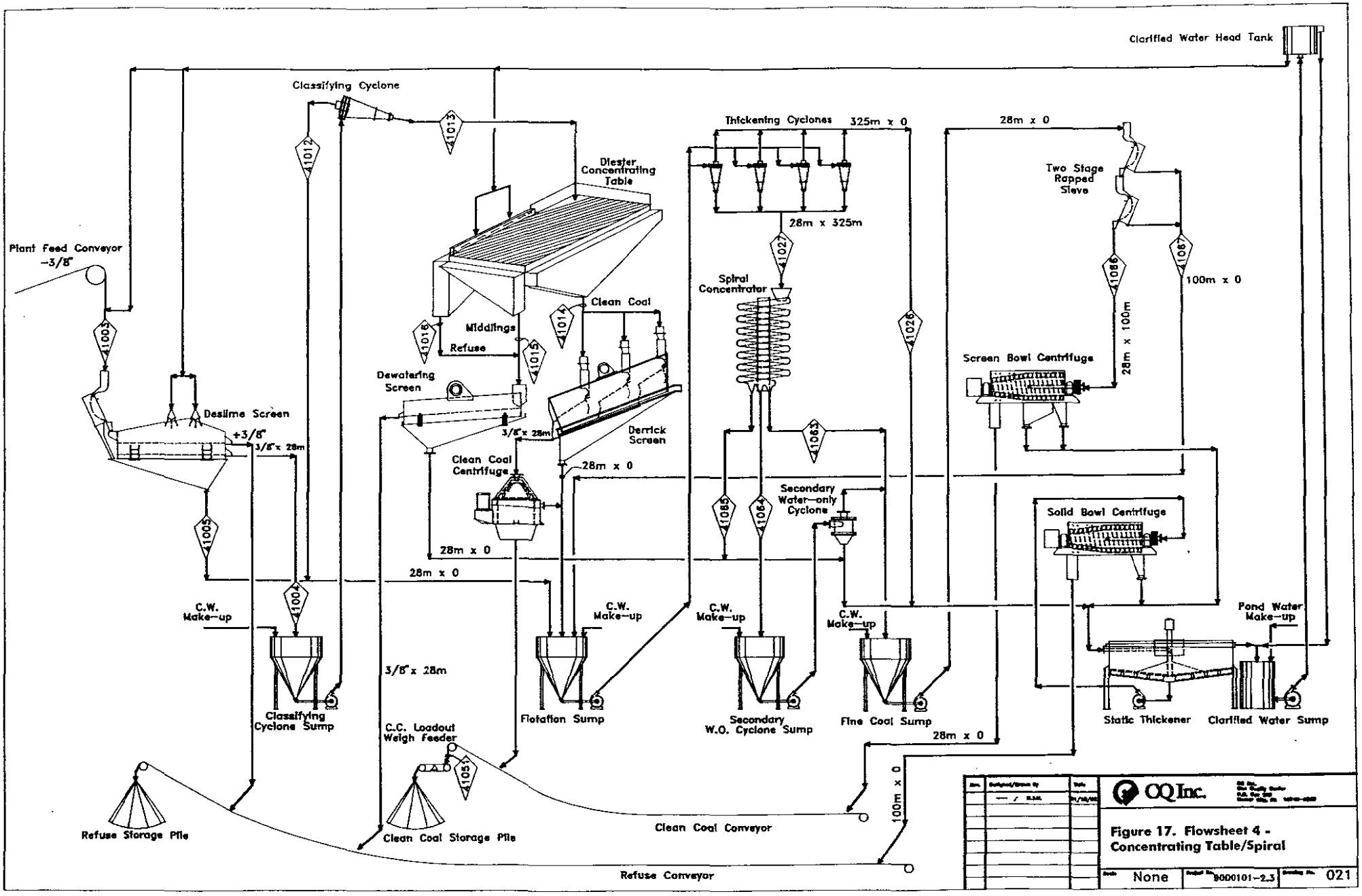
The final flowsheet is shown in Figure 17. Flowsheet 4 was used to evaluate the cleaning potential of Pratt Seam coal in a relatively simple flowsheet design that incorporated inexpensive cleaning equipment such as the concentrating table and a spiral separator. Also, the spiral was added primarily to remove fine pyrite particles that may have previously been liberated but not removed by the concentrating table.



CQ Inc.

Figure 16. Flowsheet 2 and 3 - Concentrating Table

Scale	Project No.	Drawing No.
None	90D0101-2.5	022


Clarified Water Head Tank
Classifying Cyclone
Thickening Cyclones
325m x 0
28m x 0
Diester Concentrating Table
Two Stage Rapped Sieve
Plant Feed Conveyor -3/8"
28m x 325m
Spiral Concentrator
100m x 0
Middlings
Refuse
Clean Coal
Dewatering Screen
Screen Bowl Centrifuge
28m x 100m
Deslime Screen
+3/8"
3/8" x 28m
Derrick Screen
Clean Coal Centrifuge
28m x 0
Secondary Water—only Cyclone
Solid Bowl Centrifuge
C.W. Make-up
Pond Water Make-up
Classifying Cyclone Sump
Flotation Sump
Secondary W.O. Cyclone Sump
Fine Coal Sump
Static Thickener
Clarified Water Sump
C.C. Loadout Weigh Feeder
Refuse Storage Pile
Clean Coal Storage Pile
Clean Coal Conveyor
Refuse Conveyor
1003
1004
1005
1012
1013
1014
1015
1016
1026
1027
1063
1064
1065
1085
1086
1087
1051
OQ Inc.
Figure 17. Flowsheet 4 - Concentrating Table/Spiral
None
90D0101-2.3
021

The run-of-mine coal was crushed to 3/8-in. topsize and fed to the plant at a rate of five tons per hour. The raw coal was fed to the deslime screen; the screen's top deck scalped off coal larger than 3/8-in., and the bottom deck again made a 28 mesh separation. The 3/8-in. x 28 mesh coal was pumped to the classifying cyclone to separate the plus 100 mesh material from the 100 mesh x 0. The 100 mesh x 0 overflow was combined with the underflow from the deslime screen in the flotation sump for further processing. The plus 100 mesh material was used as feed to the concentrating table. The clean coal product of the table was passed over a screen and separated into 3/8-in. x 28 mesh and 28 mesh x 0 streams. The 3/8-in. x 28 mesh was dewatered in a clean coal centrifuge and the 28 mesh x 0 fraction was combined with the same size fraction from the deslime screen in the flotation sump and sent to the thickening cyclones to be used as feed to the spiral circuit.

The spiral circuit was fed by the underflow of the thickening cyclones, which removed the 325 mesh x 0 size fraction. The spiral separated the feed into clean coal, middlings, and refuse streams. In an attempt to further remove pyritic sulfur-bearing particles from the clean product and to increase circuit yield, this stream was transferred to the fine coal sump for additional processing. The middlings stream was sent to the secondary water-only cyclone and its overflow was combined with the spiral clean coal and pumped to the sieve bends. The 100 mesh x 0 sieve bend underflow was recirculated back to the flotation sump where it was combined with the two previously mentioned streams used to feed the spiral circuit. The sieve bend overflow was sent to the screen bowl centrifuge for dewatering before reporting to the clean coal belt.

Flowsheet Performance

Because of the high ash content of the two raw coals and the difficulty encountered in cleaning them, coal cleaning produced relatively low weight yields and energy recoveries for all four flowsheets (Table 10). Flowsheet 1 had the best overall performance with a yield of 72 percent and an 89 percent energy recovery. Flowsheet 4 had a yield of 58 percent with an energy recovery of 73 percent. Overall, Flowsheets 2 and 3 produced the lowest yields (52 and 58 percent respectively) and energy recoveries (64 percent and 63 percent). Therefore, only one flowsheet test produced an

energy recovery that exceeded the targeted parameter of 86 percent.

Table 10. Flowsheet Performance

Performance Parameters	Flowsheet 1	Flowsheet 2	Flowsheet 3	Flowsheet 4
Yield (Wt %, Dry)	70	52	58	57
Energy Recovery (%)	86	64	63	73
Ash Reduction (%)	75	65	42	75
SO_2 Reduction (%)	26	22	32	26

However, significant reductions in ash and SO_2 emissions potential were obtained for all flowsheets. Flowsheet 1 reduced the ash 69 percent and the SO_2 emissions potential 26 percent; Flowsheet 2 reduced the ash 58 percent and the SO_2 emissions potential 22 percent; Flowsheet 3 reduced the ash 41 percent and reduced the SO_2 emissions potential 26 percent; and Flowsheet 4 reduced the ash by 68 percent and the SO_2 emissions potential 25 percent.

Appendix E gives weight-percent yields (Wt %) and tons-per-hour yields of the various units used in the four flowsheet tests.

Combustion-Related Laboratory Analysis

Tables 11 through 13 compare important raw coal and clean coal parameters. The tables show that all four flowsheets significantly lowered the ash content of their respective raw coals. The Pratt raw coal ash of 24.00 lb/MBtu was lowered to 9.12 lb/MBtu by Flowsheet 2, and to 6.31 lb/MBtu in Flowsheet 4. The raw Utley coal ash was decreased from 12.12 lb/Mbtu to 7.04 lb/MBtu during cleaning in Flowsheet 1 testing. Flowsheet 1 decreased the SO_2 emission potential of the raw coal blend from 4.46 lb/MBtu to 3.30 lb/MBtu. From a raw coal value of 3.95 lb SO_2/MBtu, Flowsheet 2 produced an emissions potential of 3.26 lb/MBtu, Flowsheet 3 produced an SO_2 value of 4.13 lb/MBtu from a raw coal value of 6.05 lb/MBtu, and Flowsheet 4 reduced the SO_2 potential to 3.25 lb/MBtu from 3.95 lb/MBtu.

Table 11. Pratt Raw and Clean Coal Comparisons. *(Dry Basis, Except Where Noted).*

	Raw Pratt Coal	Flowsheet 2	Flowsheet 4
Ash	24.00 lb/MBtu	9.12 lb/MBtu	6.31 lb/MBtu
SO_2	3.95 lb/MBtu	3.26 lb/MBtu	3.25 lb/MBtu

Ash Composition (Wt %) Ash Basis, SO_3 Free, Normalized to 100%

	Raw Coal	Flowsheet 2	Flowsheet 4
SiO_2	51.20	42.20	40.47
Al_2O_3	26.90	28.72	28.61
Fe_2O_3	10.63	18.14	21.29
CaO	4.30	5.83	4.78
MgO	2.00	1.47	1.07
Na_2O	0.54	0.43	0.41
K_2O	2.60	2.23	1.45
TiO_2	1.71	0.86	1.14
MnO_2	0.03	0.03	0.03
P_2O_5	0.08	0.08	0.74
Total	100.00	100.00	100.00

Ash Fusion Temperatures (°F) (Reducing/Oxidizing)

	Raw Coal, Pratt	Flowsheet 2	Flowsheet 4
Initial Deformation	2,450/2,580	2,160/2,460	2,175/2,510
Softening	2,505/2,610	2,225/2,500	2,250/2,540
Hemispherical	2,550/2,665	2,320/2,535	2,330/2,575
Fluid	2,605/2,710	2,410/2,575	2,400/2,590

Table 11. Pratt Raw and Clean Coal Comparisons (Continued). *(Dry Basis, Except Where Noted).*

	Raw Coal	Flowsheet 2	Flowsheet 4
Hardgrove Grindability Index (HGI)	62	50	49
Heating Value (Dry, Btu/lb)	10,777	13,050	13,717
Proximate Analysis (Wt %)			
Ash	25.9	11.9	8.7
Volatile Matter	31.5	36.9	38.2
Fixed Carbon	42.6	51.2	53.2
Sulfur			
Total	2.13	2.13	2.23
Sulfate	0.02	0.01	0.01
Pyritic	1.03	1.05	1.35
Ultimate Analysis (Wt %)			
Carbon	59.6	72.0	75.0
Hydrogen	4.4	5.1	5.3
Nitrogen	1.4	1.4	1.7
Sulfur	2.1	2.1	2.2
Oxygen	6.7	7.5	8.7

Table 12. Utley Raw and Clean Coal Comparisons. *(Dry Basis, Except Where Noted).*

	Raw Utley Coal	Flowsheet 3
Ash	12.12 lb/MBtu	7.04 lb/MBtu
SO_2	6.05 lb/MBtu	4.13 lb/MBtu

Ash Composition (Wt %) Ash Basis, SO_3 Free, Normalized to 100%

	Raw Coal	Flowsheet 2
SiO_2	46.08	38.52
Al_2O_3	19.95	23.49
Fe_2O_3	25.10	29.52
CaO	4.12	3.47
MgO	1.33	1.34
Na_2O	0.23	0.35
K_2O	2.09	2.15
TiO_2	0.73	0.94
MnO_2	0.06	0.04
P_2O_5	0.27	0.17
Total	100.00	100.00

Ash Fusion Temperatures (°F) (Reducing/Oxidizing)

	Raw Coal, Utley	Flowsheet 3
Initial Deformation	1,995/2,440	1,995/2,475
Softening	2,080/2,490	2,100/2,505
Hemispherical	2,200/2,515	2,225/2,525
Fluid	2,315/2,540	2,365/2,555

Table 12. Utley Raw and Clean Coal Comparisons (Continued). *(Dry Basis, Except Where Noted).*

Hardgrove Grindability Index (HGI)

	Raw Coal	Flowsheet 3
	66	53
Heating Value (Dry, Btu/lb)	12,594	13,570

Proximate Analysis (Wt %)

	Raw Coal	Flowsheet 3
Ash	15.3	9.6
Volatile Matter	36.4	39.0
Fixed Carbon	48.3	48.3
Sulfur		
Total	3.81	2.80
Sulfate	0.23	0.02
Pyritic	2.16	1.02

Ultimate Analysis (Wt %)

Carbon	68.2	73.7
Hydrogen	4.9	5.3
Nitrogen	1.3	1.5
Sulfur	3.8	2.8
Oxygen	6.6	7.1

Table 13. Pratt/Utley Blend Raw and Clean Coal Comparisons. *(Dry Basis, Except Where Noted).*

	Raw Blended Coal	Flowsheet 1
Ash	21.85 lb/MBtu	5.49 lb/MBtu
SO_2	4.46 lb/MBtu	3.30 lb/MBtu

Ash Composition (Wt %) Ash Basis, SO_3 Free, Normalized to 100%

	Raw Coal	Flowsheet 1
SiO_2	48.65	35.81
Al_2O_3	27.38	28.17
Fe_2O_3	12.69	26.42
CaO	4.42	4.88
MgO	1.59	1.16
Na_2O	0.51	0.56
K_2O	3.22	1.71
TiO_2	1.15	0.95
MnO_2	0.04	0.03
P_2O_5	0.35	0.31
Total	100.00	100.00

Ash Fusion Temperatures (° F) (Reducing/Oxidizing)

	Raw Coal, Blend	Flowsheet 1
Initial Deformation	2,375/2,550	2,080/2,495
Softening	2,440/2,600	2,175/2,520
Hemispherical	2,510/2,625	2,270/2,535
Fluid	2,580/2,670	2,350/2,550

Table 13. Pratt/Utley Blend Raw and Clean Coal Comparisons (Continued). *(Dry Basis, Except Where Noted).*

	Raw Coal	Flowsheet 1
Hardgrove Grindability Index (HGI)	50*	49*
Heating Value (Dry, Btu/lb)	11,121	13,872
Proximate Analysis (Wt %)		
Ash	24.3	7.6
Volatile Matter	31.7	38.9
Fixed Carbon	44.0	53.5
Sulfur		
Total	2.48	2.29
Sulfate	0.02	0.01
Pyritic	1.43	1.27
Ultimate Analysis (Wt %)		
Carbon	62.7	76.1
Hydrogen	4.3	5.3
Nitrogen	1.3	1.7
Sulfur	2.5	2.3
Oxygen	5.0	7.6

* Denotes Value Being Rechecked

As should be expected because of the significant reduction in the non-combustible mineral matter content of the raw coals, the dry heating value of the raw Pratt coal increased from a value of 10,777 Btu/lb to 13,050 Btu/lb, and 13,717 Btu/lb in Flowsheets 2 and 4, respectively. The raw coal blend heating value of 10,274 Btu/lb in Flowsheet 1 was increased to 13,872 Btu/lb, while cleaning in Flowsheet 3 increased the raw Utley Seam coal from 12,594 Btu/lb to 13, 570 Btu/lb.

In addition to the above commonly measured parameters of ash, sulfur, and Btu, the following additional laboratory analyses were also performed to evaluate the cleaning of the raw Pratt and Utley Seam coals, as well as the blend:

- Ash composition
- Ash fusibility
- Hardgrove grindability
- Proximate analysis
- Ultimate analysis

This information is useful to boiler operators and provides insight into the change in the coal's combustion characteristics with cleaning.

Ash Composition. Coal cleaning affects ash composition, and can change the behavior of ash in the boiler. As the previous tables show, coal cleaning significantly changed the weight percent (Wt %) of most of the ash constituents. Taking these values one step further (Table 14) presents values on a whole coal basis to give a better indication of the cleaning effectiveness of the four flowsheets in removing various components that make up the ash. These new values, given in lbs/MBtu, reflect the amount of ash-forming minerals that would enter the boiler for the raw and cleaned coals.

Based on the percent removals, Flowsheets 1 and 4 provided the largest amounts of reductions with the exception of the phosphorous pentoxide (P_2O_5) in Flowsheet 4. This was actually increased during cleaning.

Table 14. Ash Composition (lbs/MBtu). *Whole Coal, SO_3 Free Basis, Normalized to 100 Percent.*

	Raw Pratt	Raw Utley	Flowsheet 1	Flowsheet 2	Flowsheet 3	Flowsheet 4
SiO_2	12.47	5.79	2.04	3.98	2.78	2.62
Al_2O_3	6.55	2.57	1.61	2.71	1.69	1.85
Fe_2O_3	2.59	3.23	1.50	1.72	2.13	1.38
CaO	1.05	0.52	0.28	0.55	0.25	0.31
MgO	0.49	0.17	0.06	0.14	0.09	0.07
Na_2O	0.14	0.03	0.03	0.04	0.02	0.03
K_2O	0.63	0.26	0.09	0.22	0.16	0.09
TiO_2	0.42	0.09	0.05	0.09	0.06	0.07
MnO_2	0.01	0.01	0.00	0.00	0.01	0.00
P_2O_5	0.02	0.03	0.02	0.01	0.01	0.05

Ash Composition - Percent Removal (%)

	Flowsheet 1	Flowsheet 2	Flowsheet 3	Flowsheet 4
SiO_2	81	68	52	79
Al_2O_3	74	59	34	72
Fe_2O_3	47	34	34	47
CaO	71	48	52	71
MgO	83	71	47	86
Na_2O	73	72	33	79
K_2O	87	65	39	86
TiO_2	81	79	33	83
MnO_2	100	100	100	100
P_2O_5	75	50	67	60*

* Denotes an increase

Of particular interest to power generating companies such as Alabama Power Company are the concentrations of sodium and potassium in the ash of coal since, in sufficient quantity, these elements contribute to boiler fouling problems. The CQ Inc. commercial-scale cleaning tests significantly reduced the concentration of both of these ash constituents in the ash of all of the cleaned coals. Table 14 shows that the percent removal of sodium oxide ranged from 33 percent in Flowsheet 3 to 73 percent in Flowsheet 1. The same table

also shows a potassium oxide removal ranging from 39 percent in Flowsheet 3 to 87 percent in Flowsheet 1.

Overall, as illustrated by Figures 18 through 21, Flowsheet 1 produced more reductions of ash constituents than the other flowsheets. All four tests produced significant reductions in most of the ash constituents. However, reductions in certain ash constituents are not always beneficial to the particular type of boiler a utility uses. As indicated in the above tables, cleaning produced changes in some of the slagging and fouling indices for those flowsheets cleaning Pratt Seam coal, but did not affect either index for the Utley Seam coal. The fouling index for the blended coal in Flowsheet 1 went from low to medium but the slagging index was unchanged; in Flowsheets 2 and 4 cleaning Pratt Seam coal only, the slagging indices went from low to medium while the fouling indices remained unchanged. The changes in the fusibility temperatures are undoubtedly attributable to the increases of Fe_2O_3 from the raw coals to the clean coals. Lower ash fusibility temperatures would be beneficial to wet bottom boilers but may cause problems for dry bottom boilers such as Gaston Unit 5.

A "low" fouling index classification assigned to ash signifies that this coal ash will be less likely to flow in streams or drip from heat-absorption surfaces or form heavy clinkers on the grates under a fuel bed than would a medium or high fouling index classification. Likewise a "low" slagging index classification would mean that the ash is less likely to fuse on furnace walls, radiant heat surfaces, or other places subject to high gas temperatures.

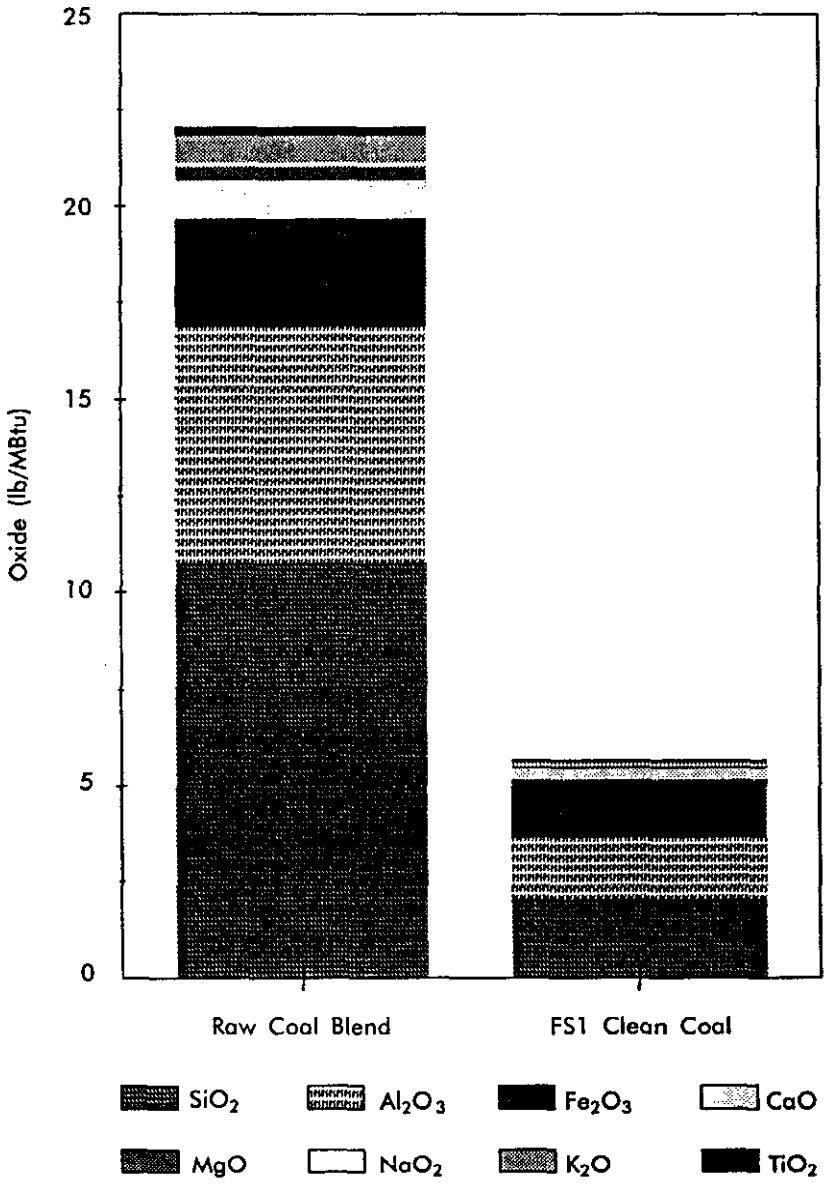


Figure 18. Ash Composition. *Raw Coal and Clean Coal Ash, Flowsheet Test No. 1, Pratt and Utley Seam Blend.*

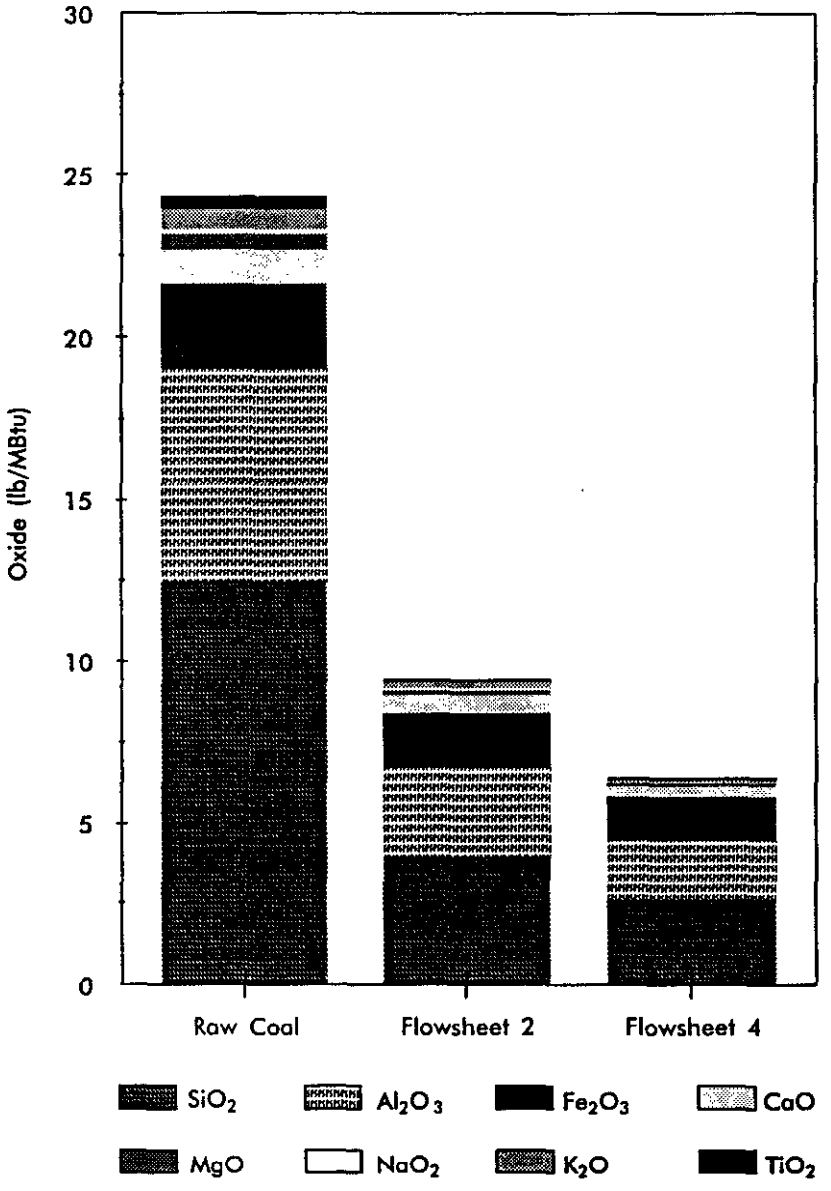


Figure 19. Ash Composition. *Raw Coal and Clean Coal Ash, Flowsheet Test No. 2 and 4, Pratt Seam Coal.*

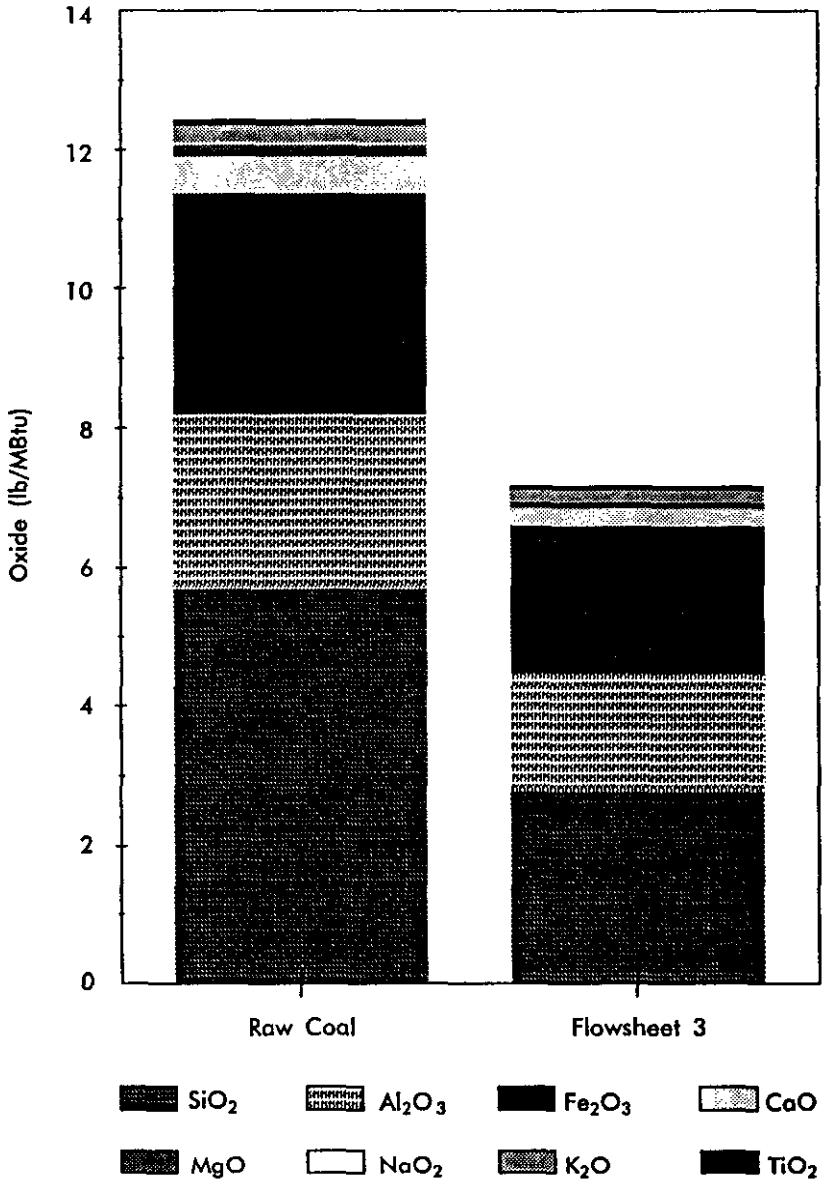


Figure 20. Ash Composition. *Raw Coal and Clean Coal Ash, Flowsheet Test No. 3, Utley Seam Coal.*

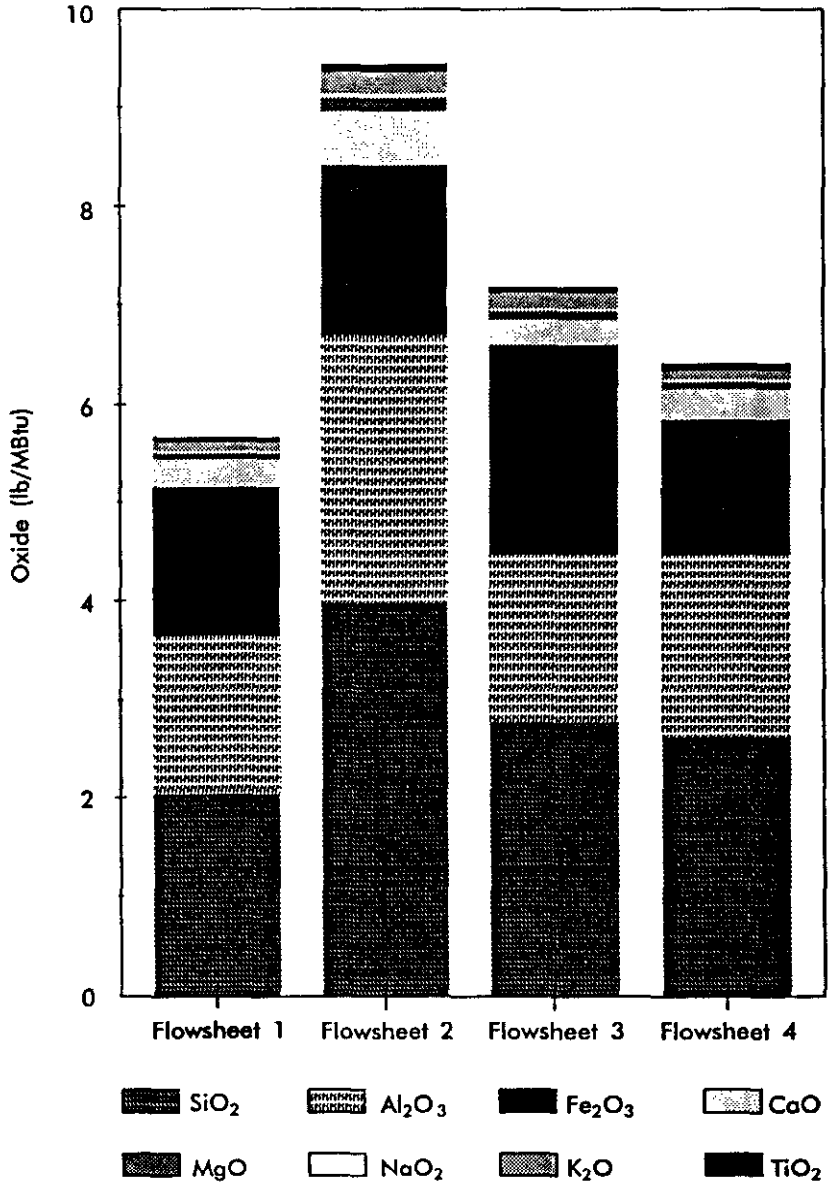


Figure 21. Flowsheet Performance. *Ash Composition Comparison, Flowsheet Tests No. 1, 2, 3 and 4, Pratt and Utley Seam Coals.*

Ash Fusibility. Of the reported ash fusibility data, the initial deformation and fluid temperatures are usually of primary concern. The initial deformation temperatures and the fluid temperatures of the ash of the raw Pratt Seam coal were changed significantly (plus or minus 100° F) by the cleaning done in Flowsheets 1, 2, and 4. There were, however, no important changes in any ash fusibility temperatures caused by cleaning Utley Seam coal in Flowsheet 3.

In Flowsheet 1, initial deformation temperatures decreased from 2,375° F (reducing atmosphere) and 2,550° F (oxidizing atmosphere) in the raw coal to 2,080° F (reducing) and 2,495° F (oxidizing) in the clean coal. Also decreased in this flowsheet were the fluid temperatures (both reducing and oxidizing atmospheres) from 2,580° F and 2,670° F in the raw coal to 2,350° F and 2,550° F in the cleaned coal. In Flowsheet 2 initial deformation temperatures decreased from 2,450° F reducing atmosphere and 2,580° F oxidizing atmosphere, to 2,160° F and 2,460° F respectively while the fluid temperatures decreased from 2,605° F reducing atmosphere to 2,410° F in the clean coal. Finally, the reducing initial deformation temperature was measured at 2,450° F in the raw Pratt coal and 2,175° F in the clean coal of Flowsheet 4 and the fluid temperatures (reducing and oxidizing) of 2,605° F and 2,710° F were decreased to 2,400° F and 2,590° F, respectively.

Hardgrove Grindability. Coal cleaning may, at times, adversely change the grindability of the coal. The Hardgrove Grindability Index (HGI) results determined for the cleaned Pratt coals (50 and 49) are lower than those measured for the raw coal (62); the HGI for the clean blended coal is 49; and the HGI for the Utley coal was lowered from 66 to 53. Cleaning, therefore, makes the raw coals harder to grind. This, along with little or no reduction of pyrites, would probably negatively impact pulverizer performance. However, the increased heating value resulting from cleaning will offset to some degree the increased grinding energy that may be needed by the pulverizers.

Proximate Analysis. A proximate analysis helps characterize how a coal reacts when it is heated; that is, how much of the coal goes off as gas and vapors (volatile matter) and the quantity that remains as fixed carbon. Also, a proximate

analysis usually quantifies the amount of ash and sulfur in the ash. Cleaning significantly decreased ash content in all four flowsheets.

Ash decreased from a raw coal value of 24.3 percent to 7.6 percent in Flowsheet 1; from 25.9 percent in Flowsheets 2 and 4 to 11.9 and 8.7 percent, respectively; and from 15.3 percent to 9.6 percent in Flowsheet 3. Total sulfur of 2.13 percent in the raw Pratt coal was unchanged in Flowsheet 2 and increased slightly to 2.23 percent in Flowsheets 4. The total sulfur of the blend decreased from 2.48 percent in the raw coal to 2.29 percent in the clean coal of Flowsheet 1. Finally, the raw Utley coal was cleaned from 3.81 percent to 2.80 percent sulfur by Flowsheet 3. Volatile matter was increased in all flowsheets cleaning Pratt raw coal, as was fixed carbon. However, while the volatile matter for the Utley raw coal was increased by cleaning, fixed carbon was unchanged in Flowsheet 3.

Ultimate Analysis. Among other things, an ultimate analysis summarizes the organic constituents of a coal and is a convenient and uniform method of comparing coals. An ultimate analysis also is required by boiler operators for computing boiler air requirements, heat losses, and weight of the products of combustion. As with the proximate analysis, cleaning produced some significant (plus or minus 10 percent) changes.

The weight percent of carbon increased for the coals of Flowsheets 2 and 4--from 59.6 percent in the raw Pratt coal to 72 percent in the coal of Flowsheet 2; 75 percent in the coal of Flowsheet 4; and from 62.7 percent in the raw coal blend to 76.1 percent in Flowsheet 1. The hydrogen content was increased from 4.4 percent in the raw Pratt coal to 5.1 percent in Flowsheet 2; 5.3 percent in Flowsheet 4; and 5.3 percent in Flowsheet 1 (up from 4.3 percent). Nitrogen also increased from a raw coal value of 1.4 percent to 1.7 percent in Flowsheet 4 and from 1.3 percent in the raw coal blend to 1.7 percent in the clean coal of Flowsheet 1. Finally, oxygen was significantly increased by cleaning--from 6.7 percent in the raw coal to 7.5 percent in Flowsheet 1 and 8.7 percent in Flowsheet 4 and from 5 percent to 7.6 percent in Flowsheet 1. Note that an increase in oxygen content signifies a decrease in the heating potential of the coal.

Trace Elements

No new constraints on trace element emissions were placed on the power generation industry under the 1990 Clean Air Act Amendments. However, new regulations may be forthcoming following a Federally-mandated three-year study period. Because of the uncertainty of the full effects of any new laws, a portion of this coal characterization study focused on determining whether certain trace elements can be removed by physical coal cleaning processes.

As with most eastern coals, the Pratt and Utley Seam coals' inorganic constituents are primarily made up of clay, rock, and shale. Some of the inorganics are inherent but the majority of the inorganic mineral matter is extraneous and can be associated with the coal seam itself and may end up included with the coal because of the mining operation. Minerals frequently found in coal are:

- Silicates
- Oxides
- Sulfides
- Sulfates
- Carbonates

A number of studies have found that specific elements in a coal can be associated with the inorganic mineral matter. Trace elements will have specific mineral associations rather than occurring sporadically throughout all forms of mineral matter in coal. For example, arsenic, mercury, and nickel have been found to have a close relationship with pyrite. On the other hand, trace elements have been found in mineral forms such as cinnabar (mercury), galena (lead), or millerite (nickel). Also, many of the mineral forms in which trace elements occur are sulfides. However, trace element-bearing minerals may also be entrapped within the coal itself. With progressively smaller particle sizes, the likelihood of the mineral occurring as a separate particle increases.

In recent years, considerable research by EPRI and other organizations has attempted to characterize the mobilization of elements in coal, its combustion gases, and ash residues.

Some physical and chemical characteristics of the ash and flue gases are directly related to the composition of the parent coal. Coal combustion can alter the chemical

composition in such a manner that certain chemicals can be dissolved and mobilized into the ash residues or gases. Of the elements studied during these tests, arsenic and selenium are associated with power plant ash fractions that are highly soluble. Volatile elements such as mercury can be found in the gases. A better understanding of the mobility of trace elements in coal cleaning residues will help determine whether or not it is environmentally advantageous to remove trace elements before combustion.

Although it is not fully understood how the different compounds and their mineral constituents are transformed during processing and combustion, it has been shown that certain of these elements (when found in the atmosphere) can sometimes be attributed to man-made sources such as coal-fired power generation. Conventional coal cleaning techniques that are effective in removing mineral matter from coal will also be effective in removing certain trace elements because of those elements' affinity for specific mineral matter.

Conventional coal cleaning using gravity separation of coarse coal fractions can be effective because they are proven methods of removing major mineral matter forms such as clays, rocks, and shales. Coal cleaning methods that involve deep cleaning of the fine coal fractions can also increase mineral matter liberation and therefore can be used to reduce associated trace elements. But as mineral matter is liberated, individual particles may react to the cleaning process differently. For example, sulfides may be captured in the froth from a flotation cell and carry associated metals with them into the clean coal.

The two raw coals and the raw coal blend in this coal cleanability study were also subjected to extensive trace element analyses. However, due to some questionable values reported in the initial analyses, trace element data will not be reported at this time. These data will be presented in an addenda to this report at a later date.

Flowsheet 1 and Typical Gaston Unit 5 As-Received Coal Comparison

As indicated, Alabama Power Company burns a blend of raw Utley and cleaned Pratt Seam coals. The percentage of raw Utley blended generally ranges near 20 percent. In order to evaluate the effects of burning the blended coals, field tests were conducted to provide boiler performance

data. As part of these field tests, composite samples of the coal fired during testing were gathered at the Gaston Station over a 14-day period and analyzed at the Homer City Coal Laboratory. Table 15 compares average values of four coal samples taken from coal received at the Gaston Steam Plant from the North River No. 1 Mine, (provided by Alabama Power Company), and the blended coal cleaned at CQ Inc. in Flowsheet 1.

Table 15 indicates that cleaning the total blend rather than just the Pratt Seam coal alone can have a positive effect on the quality of coal received at the Gaston Station from the North River No. 1 Mine. Among the more noticeable differences between the typical coal blend and the cleaned coal blend of Flowsheet 1 are that coal cleaning lowered the overall ash content from 13.1 to 7.62, or nearly 72 percent; lowered SO_2 emissions potential from 3.76 lbs/MBtu to 3.3 lbs/MBtu or nearly 14 percent; and raised the heating value from 12,686 Btu/lb to 13,872 Btu/lb or 7.24 percent.

Table 15. As-Received Average Power Plant Coal Quality and Clean Coal Comparison

	Ash	SO_2	Btu/lb	Moisture	Volatiles	Fixed Carbon
Gaston Unit 5	13.1	3.76	12,868	6.48	36.23	50.50
Flowsheet 1	7.62	3.30	13,872	4.79	38.92	53.46
Percent Difference	-71.9	-13.8	7.2	-35.3	6.5	5.5

CONCLUSIONS

This study has shown that the Pratt and Utley Seam coals in certain instances responded well to the conventional physical coal cleaning techniques used at the CQDC, although improvements in coal quality were primarily due to ash reductions and heating value increases. Flowsheet Test 1, which cleaned a blend of raw Pratt and Utley Seam coal, was able to produce significant quality improvements within the 86 percent energy recoveries prescribed by the project team. This study also has shown that, should the need arise, the Utley Seam coal can also be cleaned to an improved quality without a severe penalty in cleaning plant yield.

Since the overall sulfur content of the raw Utley Seam coal was reduced by 27 percent using a simple concentrating table, it is probable that the sulfur content can be lowered further using more efficient coal cleaning methods such as heavy-medium cyclones and froth flotation. Also, the coal cleaning tests have shown that a considerable amount of ash can be removed by cleaning. However, because the Utley Seam is a minor coal seam with associated high recovery costs, it may not be economical to deep-clean this coal at the present time.

The CQ Inc. tests show that conventional coal cleaning devices, such as jigs, spirals, water-only cyclones, and concentrating tables, can significantly reduce the overall ash content of the Pratt Seam coal and can also be used to upgrade the Utley Seam coal. However, because of the high organic sulfur content of these two coals, it would be difficult to clean them to Phase I compliance levels of 2.50 lbs SO_2/MBtu. These tests also have shown, again in Flowsheet 1, that more efficient coal cleaning methods such as heavy-medium cyclones and froth flotation can be used to remove specific contaminants and improve the overall quality of the Pratt Seam coal.

For example, ash was reduced from 25.9 percent to as low as 8.7 percent and the heating value was raised from 10,777 Btu/lb to as high as 13,717 Btu/lb. Although conventional cleaning does little to produce a compliance fuel, it does improve the overall SO_2 emissions potential, and removing a large portion of the non-combustible mineral matter would significantly reduce the coal tonnages that are shipped to the power plant, thereby lowering transportation and ash disposal costs. In addition, there is some indication that

crushing to at least 100 mesh can liberate additional sulfur, thereby making cleaning by advanced processes an alternative for producing a Phase I compliance coal if the additional costs can be justified. Also, extensive crushing before cleaning can liberate additional ash-forming mineral matter, thereby improving the ash-removal performance of the cleaning process.

Another possible improvement in the quality of Pratt Seam coal as a result of cleaning is reduction of the concentrations of many trace elements of environmental concern that can be associated with ash bearing mineral matter.

Presently, trace element data specified as part of this testing program are being re-evaluated as part of a laboratory quality assurance/quality control (QA/QC) program initiated by CQ Inc. The results of the trace element study will be included in an addendum to this report.

APPENDIX A

Pratt Seam Raw Coal Size Data

GOULD ENERGY DIVISION
P. O. BOX 214
CRESSON, PA 16630
STANDARD LABORATORIES, INC.

DATE : 4-29-92
MASTER SAMPLE NO. 144666

C. Q., INC.
1 QUALITY CENTER BOX 280
HOMER CITY, PA 15748 SAMPLE ID: RUN #7111210 PRATT SEAM

OPERATING CO.: PROJECT 90D010 TASK 2 4
MINE: DATE SAMPLED:
SAMPLED BY: CUSTOMER PROVIDED
GROSS WEIGHT: 999.8 DATE RECEIVED: 1/17/92

OTHER ID: RAW COAL CHARACTERIZATION PRIMARY SAMPLER REJECT SPLIT (NORTH RIVER #1 MINE SITE) AS RECEIVED WT PERCENTS REPORTED ON A DRY BASIS ASH PERCENTS ON AN SO3-FREE BASIS

CERTIFICATE OF ANALYSIS

FRACTION	WT%	MOISTURE	ASH	SULFUR	BTU	LBS SO2 PER MBTU	MAF BTU
+1 1/2"SQ	11.82	1.44	37.78	1.81	8843	4.09	14327
1 1/2"SQ X 3/4"SQ	24.31	2.15	26.38	2.22	10776	4.12	14776
3/4"SQ X 3/8"SQ	19.41	2.06	20.86	2.45	11581	4.23	14785
3/8"SQ X 28M	30.93	1.57	20.76	2.37	11619	4.08	14823
28M X 100M	3.69	1.71	18.27	2.09	11824	3.53	14619
100M X 325M	2.31	4.96	22.72	2.52	10948	4.60	14303
325M X 0	7.54	.73	49.81	1.25	6601	3.78	13249

CUMULATIVE RETAINED - DOWN

FRACTION	WT%	ASH	SULFUR	BTU	LBS SO2 PER MBTU
+1 1/2"SQ	11.82	37.78	1.81	8843	4.09
+1 1/2"SQ X 3/4"SQ	36.12	30.11	2.09	10144	4.12
+1 1/2"SQ X 3/8"SQ	55.54	26.88	2.21	10646	4.15
+1 1/2"SQ X 28M	86.46	24.69	2.27	10994	4.13
+1 1/2"SQ X 100M	90.15	24.43	2.26	11028	4.09
+1 1/2"SQ X 325M	92.46	24.38	2.27	11026	4.11
+1 1/2"SQ X 0	100.00	26.30	2.19	10693	4.09

CUMULATIVE RETAINED - UP

FRACTION	WT%	ASH	SULFUR	BTU	LBS SO2 PER MBTU
+1 1/2"SQ X 0	100.00	26.30	2.19	10693	4.09
1 1/2"SQ X 0	88.18	24.76	2.24	10940	4.09
3/4"SQ X 0	63.88	24.15	2.25	11003	4.09
3/8"SQ X 0	44.46	25.58	2.16	10750	4.01
28M X 0	13.54	36.59	1.70	8767	3.87
100M X 0	9.85	43.45	1.55	7622	4.06
325M X 0	7.54	49.81	1.25	6601	3.78

ANALYTICAL RESULTS ARE STATED ON A DRY BASIS.

PAGE 1

APPROVED BY Thomas A. Light

APPROVED BY Ben Petrosky

GOULD ENERGY DIVISION
P. O. BOX 214
CRESSON, PA 16630
STANDARD LABORATORIES, INC.

DATE : 4-30-92
MASTER SAMPLE NO. 144674

C. Q., INC.
1 QUALITY CENTER BOX 280
HOMER CITY, PA 15748

SAMPLE ID: RUN #91112100 PRATT SEAM

OPERATING CO. PROJECT 90D0101 TASK 2.4
MINE:
SAMPLED BY: CUSTOMER PROVIDED
GROSS WEIGHT: 999.8

DATE SAMPLED:
DATE RECEIVED: 1/17/92

OTHER ID: RAW COAL CHARACTERIZATION PRIMARY SAMPLER REJECT SPLIT (NORTH RIVER #1 MINE SITE) AS RECEIVED WT PERCENTS REPORTED ON A DRY BASIS ASH PERCENTS ON AN SO3-FREE BASIS

FEED FOR SIZE +3/4" SQ

GRAVITY		% WT	% ASH	% S	BTU	VOLATILE	FIXED CARBON
1.25		0.00	0.00	0.00	0	0.00	0.00
1.30		19.44	4.84	1.50	14438	0.00	0.00
1.35		22.36	7.84	2.54	13871	0.00	0.00
1.40		13.71	12.49	3.28	13021	0.00	0.00
1.60		15.69	22.90	2.73	11297	0.00	0.00
1.80		5.20	40.66	3.03	8339	0.00	0.00
2.00		2.13	48.45	5.52	6539	0.00	0.00
2.45		6.91	76.84	1.23	2367	0.00	0.00
2.45	SINK	14.55	90.76	.52	329	0.00	0.00

CUMULATIVE RESULTS FOR SIZE +3/4" SQ

CUMULATIVE DOWN

GRAVITY		% WT	% ASH	% S	BTU	VOLATILE	FIXED CARBON
1.25		0.00	0.00	0.00	0	0.00	0.00
1.30		19.44	4.84	1.50	14438	0.00	0.00
1.35		41.80	6.45	2.06	14134	0.00	0.00
1.40		55.52	7.94	2.36	13859	0.00	0.00
1.60		71.21	11.24	2.44	13295	0.00	0.00
1.80		76.41	13.24	2.48	12957	0.00	0.00
2.00		78.54	14.19	2.56	12783	0.00	0.00
2.45		85.45	19.26	2.45	11941	0.00	0.00
2.45	SINK	100.00	29.66	2.17	10251	0.00	0.00

CUMULATIVE UP

GRAVITY		% WT	% ASH	% S	BTU	VOLATILE	FIXED CARBON
1.25		100.00	29.66	2.17	10251	0.00	0.00
1.30		100.00	29.66	2.17	10251	0.00	0.00
1.35		80.56	35.66	2.33	9241	0.00	0.00
1.40		58.20	46.84	2.26	7462	0.00	0.00
1.60		44.48	56.78	1.94	5748	0.00	0.00
1.80		28.79	75.24	1.51	2724	0.00	0.00
2.00		23.59	82.86	1.18	1487	0.00	0.00
2.45		21.46	86.28	.75	985	0.00	0.00
2.45	SINK	14.55	90.76	.52	329	0.00	0.00

ANALYTICAL RESULTS ARE STATED ON A DRY BASIS

GOULD ENERGY DIVISION
P.O. BOX 214
CRESSON, PA 16630
STANDARD LABORATORIES, INC.

DATE: 4-30-92
MASTER SAMPLE NO. 144674

C Q., INC
1 QUALITY CENTER BOX 280
HOMER CITY, PA 15748 SAMPLE ID: RUN #911121OO PRATT SEAM

OPERATING CO.: PROJECT 90D0101 TASK 2.4
MINE: DATE SAMPLED:
SAMPLED BY: CUSTOMER PROVIDED
GROSS WEIGHT: 999.8 DATE RECEIVED: 1/17/92

OTHER ID: RAW COAL CHARACTERIZATION PRIMARY SAMPLER REJECT SPLIT (NORTH RIVER #1 MINE SITE) AS RECEIVED WT PERCENTS REPORTED ON A DRY BASIS ASH PERCENTS O N AN SO3-FREE BASIS

FEED FOR SIZE 3/4" SQ X 28M

GRAVITY		% WT	% ASH	% S	BTU	VOLATILE	FIXED CARBON
1.25		.28	2.44	1.38	14849	0.00	0.00
1.30		40.56	4.06	1.56	14467	0.00	0.00
1.35		19.45	7.54	2.71	13834	0.00	0.00
1.40		8.95	12.30	3.74	13084	0.00	0.00
1.60		10.40	22.11	3.90	11442	0.00	0.00
1.80		3.78	38.50	3.44	8590	0.00	0.00
2.00		2.04	52.62	3.34	6081	0.00	0.00
2.45		4.44	71.93	2.59	2799	0.00	0.00
2.45	SINK	10.09	89.09	1.92	549	0.00	0.00

CUMULATIVE RESULTS FOR SIZE 3/4" SQ X 28M

CUMULATIVE DOWN

GRAVITY		% WT	% ASH	% S	BTU	VOLATILE	FIXED CARBON
1.25		.28	2.44	1.38	14849	0.00	0.00
1.30		40.84	4.05	1.56	14469	0.00	0.00
1.35		60.30	5.18	1.93	14264	0.00	0.00
1.40		69.25	6.10	2.16	14112	0.00	0.00
1.60		79.65	8.19	2.39	13763	0.00	0.00
1.80		83.43	9.56	2.44	13529	0.00	0.00
2.00		85.47	10.59	2.46	13351	0.00	0.00
2.45		89.91	13.62	2.47	12830	0.00	0.00
2.45	SINK	100.00	21.24	2.41	11590	0.00	0.00

CUMULATIVE UP

GRAVITY		% WT	% ASH	% S	BTU	VOLATILE	FIXED CARBON
1.25		100.00	21.24	2.41	11590	0.00	0.00
1.30		99.72	21.29	2.41	11581	0.00	0.00
1.35		59.16	33.10	3.00	9603	0.00	0.00
1.40		39.70	45.62	3.14	7530	0.00	0.00
1.60		30.75	55.92	2.97	5918	0.00	0.00
1.80		20.35	72.29	2.49	3088	0.00	0.00
2.00		16.57	80.01	2.27	1833	0.00	0.00
2.45		14.53	83.85	2.12	1236	0.00	0.00
2.45	SINK	10.09	89.09	1.92	549	0.00	0.00

ANALYTICAL RESULTS ARE STATED ON A DRY BASIS

GOULD ENERGY DIVISION
P. O. BOX 214
CRESSON, PA 16630
STANDARD LABORATORIES, INC.

DATE : 4-30-92
MASTER SAMPLE NO. 144674

C. Q., INC.
1 QUALITY CENTER, BOX 280
HOMER CITY, PA 15748 SAMPLE ID: RUN #91112100 PRATT SEAM

OPERATING CO. : PROJECT 90D0101 TASK 2.4
MINE:
SAMPLED BY: CUSTOMER PROVIDED DATE SAMPLED:
GROSS WEIGHT: 999.8 DATE RECEIVED: 1/17/92

OTHER ID: RAW COAL CHARACTERIZATION PRIMARY SAMPLER REJECT SPLIT (NORTH RIVER #1 MINE SITE) AS RECEIVED WT PERCENTS REPORTED ON A DRY BASIS ASH PERCENTS ON AN SO3-FREE BASIS

FEED FOR SIZE 28M X 100M

GRAVITY		% WT	% ASH	% S	BTU	VOLATILE	FIXED CARBON
1.25		6.99	2.13	1.21	14728	0.00	0.00
1.30		39.82	2.78	1.30	14436	0.00	0.00
1.35		17.92	6.16	2.21	13995	0.00	0.00
1.40		5.84	10.49	3.32	13282	0.00	0.00
1.60		8.15	17.97	4.15	11975	0.00	0.00
1.80		3.04	33.69	4.52	9293	0.00	0.00
2.00		1.82	46.19	4.35	6904	0.00	0.00
2.45		3.34	67.21	3.74	3545	0.00	0.00
2.45	SINK	13.08	77.54	3.27	349	0.00	0.00

CUMULATIVE RESULTS FOR SIZE 28M X 100M

CUMULATIVE DOWN

GRAVITY		% WT	% ASH	% S	BTU	VOLATILE	FIXED CARBON
1.25		6.99	2.13	1.21	14728	0.00	0.00
1.30		46.81	2.68	1.29	14479	0.00	0.00
1.35		64.73	3.65	1.54	14345	0.00	0.00
1.40		70.57	4.21	1.69	14257	0.00	0.00
1.60		78.72	5.64	1.95	14021	0.00	0.00
1.80		81.76	6.68	2.04	13845	0.00	0.00
2.00		83.58	7.54	2.09	13694	0.00	0.00
2.45		86.92	9.83	2.15	13304	0.00	0.00
2.45	SINK	100.00	18.69	2.30	11610	0.00	0.00

CUMULATIVE UP

GRAVITY		% WT	% ASH	% S	BTU	VOLATILE	FIXED CARBON
1.25		100.00	18.69	2.30	11610	0.00	0.00
1.30		93.01	19.93	2.38	11375	0.00	0.00
1.35		53.19	32.78	3.19	9084	0.00	0.00
1.40		35.27	46.90	3.69	6589	0.00	0.00
1.60		29.48	58.40	3.76	5260	0.00	0.00
1.80		21.28	66.97	3.61	2689	0.00	0.00
2.00		18.24	72.62	3.46	1588	0.00	0.00
2.45		16.42	75.44	3.36	999	0.00	0.00
2.45	SINK	13.08	77.54	3.27	349	0.00	0.00

ANALYTICAL RESULTS ARE STATED ON A DRY BASIS

Thomas A. Light

GOULD ENERGY DIVISION
P.O. BOX 214
CRESSON, PA 16630
STANDARD LABORATORIES, INC.

DATE : 4-30-92
MASTER SAMPLE NO. 144674

C.Q., INC.
#1 QUALITY CENTER BOX 280
HOMER CITY, PA 15748

SAMPLE ID: RUN #91112100 PRATT SEAM

OPERATING CO.: PROJECT 90D0101 TASK 2.4
MINE:
SAMPLED BY: CUSTOMER PROVIDED
GROSS WEIGHT: 999.8 T

DATE SAMPLED:
DATE RECEIVED: 1/17/92

OTHER ID: RAW COAL CHARACTERIZATION PRIMARY SAMPLER REJECT SPLIT (NORTH RIVER #1 MINE SITE) AS RECEIVED WT PERCENTS REPORTED ON A DRY BASIS ASH PERCENTS ON AN SO3-FREE BASIS

FEED FOR SIZE 100M X 0

GRAVITY		% WT	% ASH	% S	BTU	VOLATILE	FIXED CARBON
1.25		0.00	0.00	0.00	0	0.00	0.00
1.30		3.67	2.52	1.12	14562	0.00	0.00
1.35		11.33	3.89	1.16	14209	0.00	0.00
1.40		9.31	5.94	1.36	13892	0.00	0.00
1.60		15.83	14.39	1.49	12560	0.00	0.00
1.80		11.80	25.39	1.32	10781	0.00	0.00
2.00		7.96	52.21	1.04	6445	0.00	0.00
2.45		8.89	68.19	1.24	3648	0.00	0.00
2.45	SINK	31.22	83.94	2.93	877	0.00	0.00

CUMULATIVE RESULTS FOR SIZE 100M X 0

CUMULATIVE DOWN

GRAVITY		% WT	% ASH	% S	BTU	VOLATILE	FIXED CARBON
1.25		0.00	0.00	0.00	0	0.00	0.00
1.30		3.67	2.52	1.12	14562	0.00	0.00
1.35		15.00	3.55	1.15	14295	0.00	0.00
1.40		24.31	4.47	1.23	14141	0.00	0.00
1.60		40.14	8.38	1.33	13517	0.00	0.00
1.80		51.93	12.24	1.33	12896	0.00	0.00
2.00		59.89	17.55	1.29	12039	0.00	0.00
2.45		68.78	24.10	1.29	10954	0.00	0.00
2.45	SINK	100.00	42.78	1.80	7808	0.00	0.00

CUMULATIVE UP

GRAVITY		% WT	% ASH	% S	BTU	VOLATILE	FIXED CARBON
1.25		100.00	42.78	1.80	7808	0.00	0.00
1.30		100.00	42.78	1.80	7808	0.00	0.00
1.35		96.33	44.31	1.82	7551	0.00	0.00
1.40		85.00	49.70	1.91	6664	0.00	0.00
1.60		75.69	65.08	1.98	5775	0.00	0.00
1.80		59.86	65.84	2.11	3981	0.00	0.00
2.00		48.07	75.77	2.30	2311	0.00	0.00
2.45		40.11	80.45	2.55	1491	0.00	0.00
2.45	SINK	31.22	83.94	2.93	877	0.00	0.00

ANALYTICAL RESULTS ARE STATED ON A DRY BASIS

WASHABILITY WITH ORGANIC SOLUTION BY GOULD ENERGY DIVISION

GOULD ENERGY DIVISION
P. O. BOX 214
CRESSON, PA 16630
STANDARD LABORATORIES, INC.

DATE : 4-30-92
MASTER SAMPLE NO. 144674

C. Q., INC.
1 QUALITY CENTER BOX 280
HOMER CITY, PA 15748

SAMPLE ID: RUN #91112100 PRATT SEAM

OPERATING CO.: PROJECT 90D0101 TASK 2.4
MINE:
SAMPLED BY: CUSTOMER PROVIDED
GROSS WEIGHT: 999.8

DATE SAMPLED:
DATE RECEIVED: 1/17/92

OTHER ID: RAW COAL CHARACTERIZATION PRIMARY SAMPLER REJECT SPLIT (NORTH RIVER #1 MINE SITE) AS RECEIVED WT PERCENTS REPORTED ON A DRY BASIS ASH PERCENTS ON AN SO3-FREE BASIS

FEED FOR COMPOSITE +3/4" SQ X 0

GRAVITY		% WT	% ASH	% S	BTU	VOLATILE	FIXED CARBON
1.25		.40	2.24	1.27	14771	0.00	0.00
1.30		29.27	4.16	1.53	14459	0.00	0.00
1.35		19.65	7.41	2.53	13876	0.00	0.00
1.40		10.59	11.80	3.31	13128	0.00	0.00
1.60		12.76	21.42	3.09	11527	0.00	0.00
1.80		5.06	36.18	2.83	9016	0.00	0.00
2.00		2.65	51.12	3.32	6343	0.00	0.00
2.45		5.73	73.40	1.81	2756	0.00	0.00
2.45	SINK	13.89	88.18	1.66	532	0.00	0.00

CUMULATIVE RESULTS FOR COMPOSITE +3/4" SQ X 0

CUMULATIVE DOWN

GRAVITY		% WT	% ASH	% S	BTU	VOLATILE	FIXED CARBON
1.25		.40	2.24	1.27	14771	0.00	0.00
1.30		29.67	4.14	1.52	14463	0.00	0.00
1.35		49.32	5.44	1.93	14229	0.00	0.00
1.40		59.91	6.57	2.17	14035	0.00	0.00
1.60		72.67	9.18	2.33	13594	0.00	0.00
1.80		77.73	10.93	2.36	13296	0.00	0.00
2.00		80.38	12.26	2.40	13067	0.00	0.00
2.45		86.11	16.32	2.36	12381	0.00	0.00
2.45	SINK	100.00	26.31	2.26	10735	0.00	0.00

CUMULATIVE UP

GRAVITY		% WT	% ASH	% S	BTU	VOLATILE	FIXED CARBON
1.25		100.00	26.31	2.26	10735	0.00	0.00
1.30		99.60	26.40	2.26	10719	0.00	0.00
1.35		70.33	35.66	2.57	9162	0.00	0.00
1.40		50.68	46.61	2.58	7334	0.00	0.00
1.60		40.09	55.81	2.39	5804	0.00	0.00
1.80		27.33	71.87	2.07	3131	0.00	0.00
2.00		22.27	79.97	1.90	1795	0.00	0.00
2.45		19.62	83.86	1.70	1181	0.00	0.00
2.45	SINK	13.89	88.18	1.66	532	0.00	0.00

ANALYTICAL RESULTS ARE STATED ON A DRY BASIS

WASHABILITY WITH ORGANIC SOLUTION BY GOULD ENERGY DIVISION

GOULD ENERGY DIVISION
P.O.BOX 214
CRESSON, PA 16630
STANDARD LABORATORIES, INC.

DATE : 4-30-92
MASTER SAMPLE NO. 144674

C.Q., INC.
QUALITY CENTER BOX 280
HOMER CITY, PA 15748 SAMPLE ID: RUN #91112100 PRATT SEAM

OPERATING CO.: PROJECT 93D0101 TASK 2 47
MINE: DATE SAMPLED:
SAMPLED BY: CUSTOMER PROVIDED
GROSS WEIGHT: 999.8 DATE RECEIVED: 1/17/92

OTHER ID: RAW COAL CHARACTERIZATION PRIMARY SAMPLER REJECT SPLIT (NORTH RIVER #1 MINE SITE) AS RECEIVED WT PERCENTS REPORTED ON A DRY BASIS ASH PERCENTS O N AN SO3-FREE BASIS

FEED FOR SIZE 100M X 0

GRAVITY		% WT	% ASH	% S	BTU	VOLATILE	FIXED CARBON
1.25		0.00	0.00	0.00	0	0.00	0.00
1.30		24.69	2.09	1.10	14485	0.00	0.00
1.35		16.68	4.49	1.27	14337	0.00	0.00
1.40		5.63	7.70	1.68	13552	0.00	0.00
1.60		8.71	12.60	1.69	12589	0.00	0.00
1.80		2.77	26.64	2.46	10388	0.00	0.00
2.00		2.13	44.70	1.73	7568	0.00	0.00
2.45		5.58	72.71	1.25	2739	0.00	0.00
2.45	SINK	33.82	86.86	2.15	344	0.00	0.00

CUMULATIVE RESULTS FOR SIZE 100M X 0

CUMULATIVE DOWN

GRAVITY		% WT	% ASH	% S	BTU	VOLATILE	FIXED CARBON
1.25		0.00	0.00	0.00	0	0.00	0.00
1.30		24.69	2.09	1.10	14485	0.00	0.00
1.35		41.37	3.05	1.17	14425	0.00	0.00
1.40		47.00	3.61	1.23	14321	0.00	0.00
1.60		55.70	5.02	1.30	14050	0.00	0.00
1.80		58.47	6.04	1.36	13877	0.00	0.00
2.00		60.60	7.40	1.37	13655	0.00	0.00
2.45		66.18	12.91	1.36	12735	0.00	0.00
2.45	SINK	100.00	37.91	1.63	8545	0.00	0.00

CUMULATIVE UP

GRAVITY		% WT	% ASH	% S	BTU	VOLATILE	FIXED CARBON
1.25		100.00	37.91	1.63	8545	0.00	0.00
1.30		100.00	37.91	1.63	8545	0.00	0.00
1.35		75.31	49.66	1.80	6597	0.00	0.00
1.40		58.63	62.51	1.95	4396	0.00	0.00
1.60		53.00	68.33	1.98	3423	0.00	0.00
1.80		44.30	79.29	2.03	1621	0.00	0.00
2.00		41.53	82.80	2.00	1036	0.00	0.00
2.45		39.40	84.86	2.02	683	0.00	0.00
2.45	SINK	33.82	86.86	2.15	344	0.00	0.00

ANALYTICAL RESULTS ARE STATED ON A DRY BASIS

WASHABILITY WITH CESIUM CHLORIDE BY PROCESS TECH

Thomas A. Light

GOULD ENERGY DIVISION
P. O. BOX 214
CRESSON, PA 16630
STANDARD LABORATORIES, INC.

DATE : 4-30-92
MASTER SAMPLE NO. 144674

C. Q., INC.
1 QUALITY CENTER BOX 280
HOMER CITY, PA 15748

SAMPLE ID: RUN #91112100 PRATT SEAM

OPERATING CO. : PROJECT 90D0101 TASK 2.4
MINE:
SAMPLED BY: CUSTOMER PROVIDED
GROSS WEIGHT: 999.8

DATE SAMPLED:
DATE RECEIVED: 1/17/92

OTHER ID: RAW COAL CHARACTERIZATION PRIMARY SAMPLER REJECT SPLIT (NORTH RIVER #1 MINE SITE) AS RECEIVED WT PERCENTS REPORTED ON A DRY BASIS ASH PERCENTS ON AN SO3-FREE BASIS

FEED FOR COMPOSITE +3/4" SQ X 0

GRAVITY		% WT	% ASH	% S	BTU	VOLATILE	FIXED CARBON
1.25		.40	2.24	1.27	14771	0.00	0.00
1.30		31.34	4.02	1.50	14460	0.00	0.00
1.35		20.17	7.37	2.51	13895	0.00	0.00
1.40		10.23	12.11	3.40	13083	0.00	0.00
1.60		12.06	21.71	3.20	11469	0.00	0.00
1.80		4.17	38.57	3.22	8613	0.00	0.00
2.00		2.07	50.06	4.02	6428	0.00	0.00
2.45		5.40	74.17	1.85	2610	0.00	0.00
2.45	SINK	14.15	88.79	1.50	412	0.00	0.00

CUMULATIVE RESULTS FOR COMPOSITE +3/4" SQ X 0

CUMULATIVE DOWN

GRAVITY		% WT	% ASH	% S	BTU	VOLATILE	FIXED CARBON
1.25		.40	2.24	1.27	14771	0.00	0.00
1.30		31.74	4.00	1.50	14464	0.00	0.00
1.35		51.92	5.31	1.89	14243	0.00	0.00
1.40		62.14	6.43	2.14	14052	0.00	0.00
1.60		74.21	8.91	2.31	13682	0.00	0.00
1.80		78.37	10.49	2.36	13365	0.00	0.00
2.00		80.45	11.51	2.40	13186	0.00	0.00
2.45		85.85	15.45	2.37	12521	0.00	0.00
2.45	SINK	100.00	25.83	2.24	10807	0.00	0.00

CUMULATIVE UP

GRAVITY		% WT	% ASH	% S	BTU	VOLATILE	FIXED CARBON
1.25		100.00	25.83	2.24	10807	0.00	0.00
1.30		99.60	25.92	2.25	10791	0.00	0.00
1.35		68.26	35.98	2.59	9107	0.00	0.00
1.40		48.08	47.99	2.63	7098	0.00	0.00
1.60		37.86	57.68	2.42	5481	0.00	0.00
1.80		25.79	74.50	2.05	2681	0.00	0.00
2.00		21.63	81.43	1.83	1538	0.00	0.00
2.45		19.55	84.75	1.60	1020	0.00	0.00
2.45	SINK	14.15	88.79	1.50	412	0.00	0.00

ANALYTICAL RESULTS ARE STATED ON A DRY BASIS

WASHABILITY WITH CESIUM CHLORIDE BY PROCESS TECH

Thomas A. Light
Tom Lowry

APPENDIX B

Utley Seam Coal Raw Coal Size Data

GOULD ENERGY DIVISION
P. O. BOX 214
CRESSON, PA 16630

STANDARD LABORATORIES, INC.

DATE : 7-22-92
MASTER SAMPLE NO. 146653

C. Q., INC.
1 QUALITY CENTER BOX 280
HOMER CITY, PA 15748

SAMPLE ID: RUN #91112101 UTTLEY SEAM

OPERATING CO.: PROJECT 90D0101 TASK 2.3
MINE:
SAMPLED BY: BOB DOSPOY
GROSS WEIGHT: 916.5

DATE SAMPLED:
DATE RECEIVED: 1/28/92

OTHER ID: RAW COAL CHARACTERIZATION PRIMARY SAMPLER REJECT SPLIT (NORTH RIVER #1 MINE SITE) AS RECEIVED WEIGHT PERCENTS REPORTED ON A DRY BASIS ASH PERCENTS ON AN SO3-FREE BASIS

THIS REPORT SUPERCEDES ALL PRIOR REPORTS WITH THE SAME LABORATORY NUMBER

CERTIFICATE OF ANALYSIS

FRACTION	WT%	MOISTURE	ASH	SULFUR	BTU	LBS SO2 PER MBTU	MAF BTU
+1 1/2"SQ	5.61	1.96	13.63	3.07	12959	4.73	15004
1 1/2"SQ X 3/4"SQ	28.34	1.84	9.12	3.50	13664	5.12	15035
3/4"SQ X 3/8"SQ	20.38	1.97	9.14	3.75	13645	5.49	15018
3/8"SQ X 28M	32.37	1.02	12.55	3.65	13056	5.59	14929
28M X 100M	4.12	1.61	21.58	3.55	11601	6.11	14792
100M X 325M	2.13	1.42	26.36	3.29	10771	6.10	14626
325M X 0	7.05	1.58	60.14	1.50	5384	5.57	13505

CUMULATIVE RETAINED - DOWN

FRACTION	WT%	ASH	SULFUR	BTU	LBS SO2 PER MBTU
+1 1/2"SQ	5.61	13.63	3.07	12959	4.73
+1 1/2"SQ X 3/4"SQ	33.95	9.86	3.43	13548	5.06
+1 1/2"SQ X 3/8"SQ	54.33	9.59	3.55	13584	5.22
+1 1/2"SQ X 28M	86.70	10.70	3.59	13387	5.36
+1 1/2"SQ X 100M	90.82	11.19	3.59	13306	5.39
+1 1/2"SQ X 325M	92.95	11.54	3.58	13248	5.40
+1 1/2"SQ X 0	100.00	14.97	3.43	12693	5.40

CUMULATIVE RETAINED - UP

FRACTION	WT%	ASH	SULFUR	BTU	LBS SO2 PER MBTU
+1 1/2 X 0	100.00	14.97	3.43	12693	5.40
1 1/2"SQ X 0	94.39	15.05	3.45	12678	5.44
3/4"SQ X 0	66.05	17.59	3.43	12254	5.59
3/8"SQ X 0	45.67	21.36	3.29	11634	5.65
28M X 0	13.30	42.79	2.42	8171	5.92
100M X 0	9.18	52.31	1.92	6633	5.78
325M X 0	7.05	60.14	1.50	5384	5.57

ANALYTICAL RESULTS ARE STATED ON A DRY BASIS

PAGE 1

APPROVED BY Thomas A. Light

APPROVED BY

GOULD ENERGY DIVISION
P.O. BOX 214
CRESSON, PA 16630

STANDARD LABORATORIES, INC.

DATE : 7-22-92
MASTER SAMPLE NO. 146661

C.Q., INC.
1 QUALITY CENTER BOX 280
HOMER CITY, PA 15748

SAMPLE ID: RUN #91112101 UTTLEY SEAM

OPERATING CO.: PROJECT #90D0101 TASK 2.3
MINE:
SAMPLED BY: BOB DOSPOY
GROSS WEIGHT: 916.5

DATE SAMPLED:
DATE RECEIVED: 1/28/92

OTHER ID: RAW COAL CHARACTERIZATION PRIMARY SAMPLER REJECT SPLIT (NORTH RIVER #1 MINE SITE) AS REC'D WEIGHT PERCENTS REPORTED ON A DRY BASIS ASH PERCENTS ON AN SO3-FREE BASIS

THIS REPORT SUPERCEDES ALL PRIOR REPORTS WITH THE SAME LABORATORY NUMBER

FEED FOR SIZE +3/4" SQ

GRAVITY		% WT	% ASH	% S	BTU	VOLATILE	FIXED CARBON
1.25		7.46	1.95	1.34	14876	0.00	0.00
1.30		38.64	2.89	1.87	14789	0.00	0.00
1.35		28.15	7.73	3.49	13901	0.00	0.00
1.40		10.41	12.05	4.25	13103	0.00	0.00
1.60		8.48	19.57	6.23	12005	0.00	0.00
1.80		1.89	34.18	7.80	9361	0.00	0.00
2.00		.49	38.34	16.14	8618	0.00	0.00
2.45		.96	50.26	19.49	6526	0.00	0.00
2.45	SINK	3.52	74.02	20.15	2658	0.00	0.00

CUMULATIVE RESULTS FOR SIZE +3/4" SQ

CUMULATIVE DOWN

GRAVITY		% WT	% ASH	% S	BTU	VOLATILE	FIXED CARBON
1.25		7.46	1.95	1.34	14896	0.00	0.00
1.30		46.10	2.74	1.79	14807	0.00	0.00
1.35		74.25	4.63	2.43	14463	0.00	0.00
1.40		84.66	5.54	2.66	14296	0.00	0.00
1.60		93.14	6.82	2.98	14087	0.00	0.00
1.80		95.03	7.36	3.08	13993	0.00	0.00
2.00		95.52	7.52	3.14	13966	0.00	0.00
2.45		96.48	7.95	3.31	13892	0.00	0.00
2.45	SINK	100.00	10.27	3.90	13496	0.00	0.00

CUMULATIVE UP

GRAVITY		% WT	% ASH	% S	BTU	VOLATILE	FIXED CARBON
1.25		100.00	10.27	3.90	13496	0.00	0.00
1.30		92.54	10.94	4.11	13384	0.00	0.00
1.35		53.90	16.72	5.71	12376	0.00	0.00
1.40		25.75	26.55	8.13	10708	0.00	0.00
1.60		15.34	36.38	10.76	9084	0.00	0.00
1.80		6.86	57.17	16.37	5472	0.00	0.00
2.00		4.97	65.91	19.63	3993	0.00	0.00
2.45		4.48	68.93	20.01	3487	0.00	0.00
2.45	SINK	3.52	74.02	20.15	2658	0.00	0.00

ANALYTICAL RESULTS ARE STATED ON A DRY BASIS

Thomas A. Light

GOULD ENERGY DIVISION
P.O. BOX 214
CRESSON, PA 16630

STANDARD LABORATORIES, INC.

DATE : 7-22-92
MASTER SAMPLE NO. 146661

C.Q., INC.
1 QUALITY CENTER BOX 280
HOMER CITY, PA 15748

SAMPLE ID: RUN #91112101 UTTLEY SEAM

OPERATING CO.: PROJECT #90D0101 TASK 2.3
MINE:
SAMPLED BY: BOB DOSPOY
GROSS WEIGHT: 916.5

DATE SAMPLED:
DATE RECEIVED: 1/28/92

OTHER ID: RAW COAL CHARACTERIZATION PRIMARY SAMPLER REJECT SPLIT (NORTH RIVER #1 MINE SITE) AS REC'D WEIGHT PERCENTS REPORTED ON A DRY BASIS ASH PERCENTS ON AN SO3-FREE BASIS

THIS REPORT SUPERCEDES ALL PRIOR REPORTS WITH THE SAME LABORATORY NUMBER

FEED FOR SIZE 3/4" SQ X 28M

GRAVITY		% WT	% ASH	% S	BTU	VOLATILE	FIXED CARBON
1.25		9.82	1.62	1.33	15019	0.00	0.00
1.30		40.86	3.27	2.04	14683	0.00	0.00
1.35		21.87	7.44	3.78	13799	0.00	0.00
1.40		9.93	11.58	4.78	12373	0.00	0.00
1.60		9.34	18.89	6.76	12730	0.00	0.00
1.80		1.79	34.90	9.26	9194	0.00	0.00
2.00		.86	47.13	9.60	7164	0.00	0.00
2.45		2.02	65.26	8.18	4279	0.00	0.00
2.45	SINK	3.50	82.92	8.65	1634	0.00	0.00

CUMULATIVE RESULTS FOR SIZE 3/4" SQ X 28M

CUMULATIVE DOWN

GRAVITY		% WT	% ASH	% S	BTU	VOLATILE	FIXED CARBON
1.25		9.82	1.62	1.33	15019	0.00	0.00
1.30		50.69	2.95	1.90	14748	0.00	0.00
1.35		72.56	4.30	2.47	14522	0.00	0.00
1.40		82.49	5.18	2.75	14263	0.00	0.00
1.60		91.83	6.57	3.16	14128	0.00	0.00
1.80		93.62	7.12	3.27	14033	0.00	0.00
2.00		94.48	7.48	3.33	13971	0.00	0.00
2.45		96.50	8.69	3.43	13768	0.00	0.00
2.45	SINK	100.00	11.29	3.61	13343	0.00	0.00

CUMULATIVE UP

GRAVITY		% WT	% ASH	% S	BTU	VOLATILE	FIXED CARBON
1.25		100.00	11.29	3.61	13343	0.00	0.00
1.30		90.18	12.34	3.86	13161	0.00	0.00
1.35		49.31	19.86	5.37	11900	0.00	0.00
1.40		27.44	29.75	6.64	10227	0.00	0.00
1.60		17.51	40.06	7.70	9009	0.00	0.00
1.80		8.17	64.26	8.77	4526	0.00	0.00
2.00		6.38	72.50	8.63	3217	0.00	0.00
2.45		5.52	76.46	8.48	2602	0.00	0.00
2.45	SINK	3.50	82.92	8.65	1634	0.00	0.00

ANALYTICAL RESULTS ARE STATED ON A DRY BASIS

Thomas A. Right

GOULD ENERGY DIVISION
P.O.BOX 214
CRESSON, PA 16630

STANDARD LABORATORIES,INC.

DATE : 7-22-92
MASTER SAMPLE NO. 146661

C.Q., INC.
1 QUALITY CENTER BOX 280
HOMER CITY, PA 15748

SAMPLE ID: RUN #91112101 UTTLEY SEAM

OPERATING CO.: PROJECT #90D0101 TASK 2.3
MINE:
SAMPLED BY: BOB DOSPOY
GROSS WEIGHT: 916.5

DATE SAMPLED:
DATE RECEIVED: 1/28/92

OTHER ID: RAW COAL CHARACTERIZATION PRIMARY SAMPLER REJECT SPLIT (NORTH RIVER #1 MINE SITE) AS REC'D WEIGHT PERCENTS REPORTED ON A DRY BASIS ASH PERCENTS ON AN SO3-FREE BASIS

THIS REPORT SUPERCEDES ALL PRIOR REPORTS WITH THE SAME LABORATORY NUMBER

FEED FOR SIZE 28M X 100M

GRAVITY		% WT	% ASH	% S	BTU	VOLATILE	FIXED CARBON
1.25		1.60	2.08	1.35	14827	0.00	0.00
1.30		42.11	2.22	1.46	14604	0.00	0.00
1.35		13.34	5.12	2.54	14195	0.00	0.00
1.40		6.43	8.72	3.53	13484	0.00	0.00
1.60		10.55	15.17	4.61	12874	0.00	0.00
1.80		4.14	28.48	5.99	8996	0.00	0.00
2.00		2.60	43.99	6.34	7640	0.00	0.00
2.45		5.83	67.76	4.90	3029	0.00	0.00
2.45	SINK	13.41	83.78	8.15	1234	0.00	0.00

CUMULATIVE RESULTS FOR SIZE 28M X 100M

CUMULATIVE DOWN

GRAVITY		% WT	% ASH	% S	BTU	VOLATILE	FIXED CARBON
1.25		1.60	2.08	1.35	14827	0.00	0.00
1.30		43.71	2.21	1.46	14612	0.00	0.00
1.35		57.04	2.89	1.71	14515	0.00	0.00
1.40		63.47	3.48	1.90	14410	0.00	0.00
1.60		74.02	5.15	2.28	14191	0.00	0.00
1.80		78.16	6.38	2.48	13884	0.00	0.00
2.00		80.76	7.59	2.60	13683	0.00	0.00
2.45		86.59	11.64	2.76	13020	0.00	0.00
2.45	SINK	100.00	21.32	3.48	11440	0.00	0.00

CUMULATIVE UP

GRAVITY		% WT	% ASH	% S	BTU	VOLATILE	FIXED CARBON
1.25		100.00	21.32	3.48	11440	0.00	0.00
1.30		98.40	21.63	3.52	11384	0.00	0.00
1.35		56.29	36.15	5.05	8976	0.00	0.00
1.40		42.96	45.79	5.83	7356	0.00	0.00
1.60		36.53	52.31	6.23	6277	0.00	0.00
1.80		25.98	67.39	6.89	3599	0.00	0.00
2.00		21.84	74.77	7.06	2689	0.00	0.00
2.45		19.24	78.93	7.16	2020	0.00	0.00
2.45	SINK	13.41	83.78	8.15	1234	0.00	0.00

ANALYTICAL RESULTS ARE STATED ON A DRY BASIS

Thomas A. Right

GOULD ENERGY DIVISION
P.O.BOX 214
CRESSON, PA 16630

STANDARD LABORATORIES,INC.

DATE : 7-22-92
MASTER SAMPLE NO. 146661

C.Q., INC.
1 QUALITY CENTER BOX 280
HOMER CITY, PA 15748

SAMPLE ID: RUN #91112101 UTTLEY SEAM

OPERATING CO.: PROJECT #90D0101 TASK 2.3
MINE:
SAMPLED BY: BOB DOSPOY
GROSS WEIGHT: 916.5

DATE SAMPLED:
DATE RECEIVED: 1/28/92

OTHER ID: RAW COAL CHARACTERIZATION PRIMARY SAMPLER REJECT SPLIT (NORTH RIVER #1 MINE SITE) AS REC'D WEIGHT PERCENTS REPORTED ON A DRY BASIS ASH PERCENTS ON AN SO3-FREE BASIS

THIS REPORT SUPERCEDES ALL PRIOR REPORTS WITH THE SAME LABORATORY NUMBER

FEED FOR SIZE 100M X 0

GRAVITY		% WT	% ASH	% S	BTU	VOLATILE	FIXED CARBON
1.25		0.00	0.00	0.00	0	0.00	0.00
1.30		16.49	2.15	1.18	14537	0.00	0.00
1.35		7.94	4.41	1.30	13706	0.00	0.00
1.40		5.16	6.34	1.27	13309	0.00	0.00
1.60		12.39	8.22	1.18	13631	0.00	0.00
1.80		3.54	22.14	1.98	11232	0.00	0.00
2.00		2.11	45.96	2.24	7140	0.00	0.00
2.45		7.27	74.30	1.51	2778	0.00	0.00
2.45	SINK	45.11	90.42	2.38	380	0.00	0.00

CUMULATIVE RESULTS FOR SIZE 100M X 0

CUMULATIVE DOWN

GRAVITY		% WT	% ASH	% S	BTU	VOLATILE	FIXED CARBON
1.25		0.00	0.00	0.00	0	0.00	0.00
1.30		16.49	2.15	1.18	14537	0.00	0.00
1.35		24.43	2.89	1.22	14332	0.00	0.00
1.40		29.59	3.49	1.23	14241	0.00	0.00
1.60		41.98	4.89	1.21	14061	0.00	0.00
1.80		45.52	6.23	1.27	13841	0.00	0.00
2.00		47.63	7.99	1.32	13544	0.00	0.00
2.45		54.89	16.77	1.34	12118	0.00	0.00
2.45	SINK	100.00	49.99	1.81	6824	0.00	0.00

CUMULATIVE UP

GRAVITY		% WT	% ASH	% S	BTU	VOLATILE	FIXED CARBON
1.25		100.00	49.99	1.81	6824	0.00	0.00
1.30		100.00	49.99	1.81	6824	0.00	0.00
1.35		83.51	59.43	1.93	5301	0.00	0.00
1.40		75.57	65.21	2.00	4397	0.00	0.00
1.60		70.41	69.53	2.06	3707	0.00	0.00
1.80		58.02	82.62	2.24	1588	0.00	0.00
2.00		54.48	86.55	2.26	962	0.00	0.00
2.45		52.37	88.18	2.26	713	0.00	0.00
2.45	SINK	45.11	90.42	2.38	380	0.00	0.00

ANALYTICAL RESULTS ARE STATED ON A DRY BASIS

UNCORRECTED WASHABILITY WITH CESIUM CHLORIDE BY PROCESS TECH

Thomas A. Right

GOULD ENERGY DIVISION
P. O. BOX 214
CRESSON, PA 16630

STANDARD LABORATORIES, INC.

DATE : 7-22-92
MASTER SAMPLE NO. 146661

C. Q. , INC.
1 QUALITY CENTER BOX 280
HOMER CITY, PA 15748

SAMPLE ID: RUN #91112101 UTTLEY SEAM

OPERATING CO.: PROJECT #90D0101 TASK 2.3
MINE:
SAMPLED BY: BOB DOSPOY
GROSS WEIGHT: 916.5

DATE SAMPLED:
DATE RECEIVED: 1/28/92

OTHER ID: RAW COAL CHARACTERIZATION PRIMARY SAMPLER REJECT SPLIT (NORTH RIVER #1 MINE SITE) AS REC'D WEIGHT PERCENTS REPORTED ON A DRY BASIS ASH PERCENTS ON AN SO3-FREE BASIS

THIS REPORT SUPERCEDES ALL PRIOR REPORTS WITH THE SAME LABORATORY NUMBER

FEED FOR COMPOSITE +3/4" SQ X 0

GRAVITY		% WT	% ASH	% S	BTU	VOLATILE	FIXED CARBON
1.25		7.78	1.73	1.33	14977	0.00	0.00
1.30		37.92	3.05	1.92	14710	0.00	0.00
1.35		22.37	7.41	3.54	13959	0.00	0.00
1.40		9.51	11.42	4.37	12747	0.00	0.00
1.60		9.38	17.63	5.82	12729	0.00	0.00
1.80		2.08	32.16	7.41	9498	0.00	0.00
2.00		.92	44.93	8.86	7477	0.00	0.00
2.45		2.30	66.02	7.50	4115	0.00	0.00
2.45	SINK	7.73	85.62	7.03	1092	0.00	0.00

CUMULATIVE RESULTS FOR COMPOSITE +3/4" SQ X 0

CUMULATIVE DOWN

GRAVITY		% WT	% ASH	% S	BTU	VOLATILE	FIXED CARBON
1.25		7.78	1.73	1.33	14977	0.00	0.00
1.30		45.70	2.82	1.82	14756	0.00	0.00
1.35		68.07	4.33	2.39	14494	0.00	0.00
1.40		77.59	5.20	2.63	14280	0.00	0.00
1.60		86.96	6.54	2.98	14112	0.00	0.00
1.80		89.05	7.14	3.08	14005	0.00	0.00
2.00		89.97	7.52	3.14	13938	0.00	0.00
2.45		92.27	8.98	3.25	13693	0.00	0.00
2.45	SINK	100.00	14.91	3.54	12718	0.00	0.00

CUMULATIVE UP

GRAVITY		% WT	% ASH	% S	BTU	VOLATILE	FIXED CARBON
1.25		100.00	14.91	3.54	12718	0.00	0.00
1.30		92.22	16.02	3.73	12528	0.00	0.00
1.35		54.30	25.08	4.99	11004	0.00	0.00
1.40		31.93	37.47	6.00	8933	0.00	0.00
1.60		22.41	48.53	6.68	7314	0.00	0.00
1.80		13.04	70.75	7.30	3419	0.00	0.00
2.00		10.95	78.09	7.29	2263	0.00	0.00
2.45		10.03	81.13	7.14	1785	0.00	0.00
2.45	SINK	7.73	85.62	7.03	1092	0.00	0.00

ANALYTICAL RESULTS ARE STATED ON A DRY BASIS

UNCORRECTED WASHABILITY WITH CESIUM CHLORIDE BY PROCESS TECH

Thomas A. Light

APPENDIX C

Pratt Seam Raw Coal Liberation Data

GOULD ENERGY DIVISION
P. O. BOX 214
CRESSON, PA 16630

STANDARD LABORATORIES, INC.

DATE : 5- 1-92
MASTER SAMPLE NO. 153835

C. Q., INC.
1 QUALITY CENTER BOX 280
HOMER CITY, PA 15748

SAMPLE ID: RUN #91112100 PRATT SEAM

OPERATING CO.: PROJECT #90D0101 TASK 2.3
MINE:
SAMPLED BY: CUSTOMER PROVIDED
GROSS WEIGHT: 327.4 KG

DATE SAMPLED:
DATE RECEIVED: 3/20/982

OTHER ID: AS RECEIVED CRUSHED TO 3/8" WEIGHT PERCENTS REPORTED ON A DRY BASIS
ASH PERCENTS ON AN SO3-FREE BASIS

CERTIFICATE OF ANALYSIS

FRACTION	WT%	MOISTURE	ASH	SULFUR	BTU	LBS SO2 PER MBTU	MAF BTU
+3/8"SQ	.47	1.37	41.47	2.00	8341	4.79	1425
3/8"SQ X 28M	77.83	1.21	24.52	2.28	11092	4.11	1487
28M X 100M	9.59	1.50	22.80	2.21	11147	3.96	1443
100M X 325M	3.77	1.25	23.19	2.42	10979	4.40	1429
325M X 0	8.34	1.08	46.82	1.30	7193	3.61	1352

CUMULATIVE RETAINED - DOWN

FRACTION	WT%	ASH	SULFUR	BTU	LBS SO2 PER MBTU
+3/8"SQ	.47	41.47	2.00	8341	4.79
+3/8"SQ X 28M	78.30	24.62	2.28	11075	4.11
+3/8"SQ X 100M	87.89	24.42	2.27	11083	4.09
+3/8"SQ X 325M	91.66	24.37	2.28	11079	4.11
+3/8"SQ X 0	100.00	26.24	2.19	10755	4.07

CUMULATIVE RETAINED - UP

FRACTION	WT%	ASH	SULFUR	BTU	LBS SO2 PER MBTU
+3/8"SQ X 0	100.00	26.24	2.19	10755	4.07
3/8"SQ X 0	99.53	26.17	2.20	10766	4.08
28M X 0	21.70	32.10	1.90	9598	3.96
100M X 0	12.11	39.46	1.65	8373	3.94
325M X 0	8.34	46.82	1.30	7193	3.61

ANALYTICAL RESULTS ARE STATED ON A DRY BASIS

APPROVED BY

GOULD ENERGY DIVISION
P.O. BOX 214
CRESSON, PA 16630

STANDARD LABORATORIES, INC.

DATE : 5- 1-92
MASTER SAMPLE NO. 153841

C.Q., INC.
1 QUALITY CENTER BOX 280
HOMER CITY, PA 15748

SAMPLE ID: RUN #91112100 PRATT SEAM

OPERATING CO.: PROJECT #90D0101 TASK 2.3
MINE:
SAMPLED BY: CUSTOMER PROVIDED
GROSS WEIGHT: 327.4 KG

DATE SAMPLED:
DATE RECEIVED: 8/20/982

OTHER ID: AS RECEIVED CRUSHED TO 3/8" WEIGHT PERCENTS REPORTED ON A DRY BASIS
ASH PERCENTS ON AN SO3-FREE BASIS

FEED FOR SIZE 3/8"SQ X 28M

GRAVITY		% WT	% ASH	% S	BTU	VOLATILE	FIXED CARBON
1.25		.94	2.75	1.25	14718	0.00	0.00
1.30		36.86	4.25	1.52	14401	0.00	0.00
1.35		20.52	8.23	2.64	13712	0.00	0.00
1.40		7.97	13.82	3.28	12772	0.00	0.00
1.60		8.68	24.11	3.35	11040	0.00	0.00
1.80		4.48	39.49	2.67	8419	0.00	0.00
2.00		2.94	54.33	2.77	5993	0.00	0.00
2.45		5.34	74.65	2.49	2575	0.00	0.00
2.45	SINK	12.27	89.20	1.84	552	0.00	0.00

CUMULATIVE RESULTS FOR SIZE 3/8"SQ X 28M

CUMULATIVE DOWN

GRAVITY		% WT	% ASH	% S	BTU	VOLATILE	FIXED CARBON
1.25		.94	2.75	1.25	14718	0.00	0.00
1.30		37.80	4.21	1.52	14409	0.00	0.00
1.35		58.32	5.63	1.91	14164	0.00	0.00
1.40		66.29	6.61	2.08	13996	0.00	0.00
1.60		74.97	8.64	2.22	13654	0.00	0.00
1.80		79.45	10.38	2.25	13359	0.00	0.00
2.00		82.39	11.95	2.27	13096	0.00	0.00
2.45		87.73	15.76	2.28	12456	0.00	0.00
2.45	SINK	100.00	24.77	2.23	10995	0.00	0.00

CUMULATIVE UP

GRAVITY		% WT	% ASH	% S	BTU	VOLATILE	FIXED CARBON
1.25		100.00	24.77	2.23	10995	0.00	0.00
1.30		99.06	24.98	2.24	10960	0.00	0.00
1.35		62.20	37.27	2.66	8921	0.00	0.00
1.40		41.68	51.57	2.67	6562	0.00	0.00
1.60		33.71	60.49	2.52	5093	0.00	0.00
1.80		25.03	73.10	2.24	3031	0.00	0.00
2.00		20.55	80.43	2.14	1856	0.00	0.00
2.45		17.61	84.79	2.04	1166	0.00	0.00
2.45	SINK	12.27	89.20	1.84	552	0.00	0.00

ANALYTICAL RESULTS ARE STATED ON A DRY BASIS

GOULD ENERGY DIVISION
P.O.BOX 214
CRESSON, PA 16630

STANDARD LABORATORIES, INC.

DATE : 5- 1-92
MASTER SAMPLE NO. 153841

C.Q., INC.
1 QUALITY CENTER BOX 280
HOMER CITY, PA 15748

SAMPLE ID: RUN #91112100 PRATT SEAM

OPERATING CO.: PROJECT #RODO10J TASK 2.3
MINE: DATE SAMPLED:
SAMPLED BY: CUSTOMER PROVIDED
GROSS WEIGHT: 327.4 KG DATE RECEIVED: 8/20/982

OTHER ID: AS RECEIVED CRUSHED TO 3/8" WEIGHT PERCENTS REPORTED ON A DRY BASIS
ASH PERCENTS ON AN SO3-FREE BASIS

FEED FOR SIZE 28M X 100M

AVITY		% WT	% ASH	% S	BTU	VOLATILE	FIXED CARBON
1.25		.33	2.93	1.24	14536	0.00	0.00
1.30		36.91	3.07	1.18	14311	0.00	0.00
.35		19.58	6.12	2.02	14008	0.00	0.00
.40		6.64	10.41	2.93	13228	0.00	0.00
1.60		10.61	16.43	3.36	12079	0.00	0.00
1.80		4.12	32.62	3.81	9426	0.00	0.00
2.00		2.55	49.47	3.69	6732	0.00	0.00
.45		4.01	68.68	3.18	3295	0.00	0.00
.45	SINK	15.25	83.39	2.70	510	0.00	0.00

CUMULATIVE RESULTS FOR SIZE 28M X 100M

CUMULATIVE DOWN

AVITY		% WT	% ASH	% S	BTU	VOLATILE	FIXED CARBON
1.25		.33	2.93	1.24	14536	0.00	0.00
1.30		37.24	3.07	1.18	14313	0.00	0.00
.35		56.82	4.12	1.47	14208	0.00	0.00
.40		63.46	4.78	1.62	14105	0.00	0.00
1.60		74.07	6.45	1.87	13815	0.00	0.00
1.80		78.19	7.83	1.97	13584	0.00	0.00
2.00		80.74	9.14	2.03	13367	0.00	0.00
.45		84.75	11.96	2.08	12891	0.00	0.00
.45	SINK	100.00	22.85	2.18	11003	0.00	0.00

CUMULATIVE UP

RAVITY		% WT	% ASH	% S	BTU	VOLATILE	FIXED CARBON
1.25		100.00	22.85	2.18	11003	0.00	0.00
1.30		99.67	22.92	2.18	10991	0.00	0.00
1.35		62.76	34.59	2.77	9038	0.00	0.00
1.40		43.18	47.50	3.11	6785	0.00	0.00
1.60		36.54	54.24	3.14	5614	0.00	0.00
1.80		25.93	69.71	3.05	2969	0.00	0.00
2.00		21.81	76.72	2.91	1750	0.00	0.00
2.45		19.26	80.88	2.80	1090	0.00	0.00
2.45	SINK	15.25	83.39	2.70	510	0.00	0.00

ANALYTICAL RESULTS ARE STATED ON A DRY BASIS

Thomas A. Pratt

GOULD ENERGY DIVISION
P.O. BOX 214
CRESSON, PA 16630

STANDARD LABORATORIES, INC.

DATE : 4-30-92
MASTER SAMPLE NO. 1538

C.Q., INC.
1 QUALITY CENTER BOX 280
HOMER CITY, PA 15748 SAMPLE ID: RUN #91112100 PRATT SEAM

OPERATING CO.: PROJECT #90D0101 TASK 2/3
MINE: DATE SAMPLED:
SAMPLED BY: CUSTOMER PROVIDED DATE RECEIVED: 3/20/982
GROSS WEIGHT: 327.4 KG

OTHER ID: AS RECEIVED CRUSHED TO 3/8" WEIGHT PERCENTS REPORTED ON A DRY BASIS
ASH PERCENTS ON AN SO3-FREE BASIS

FEED FOR SIZE 100M X 0

GRAVITY		% WT	% ASH	% S	BTU	VOLATILE	FIXED CARBO
1.25		.27	3.38	1.08	14587	0.00	0.00
1.30		6.85	3.66	1.13	14435	0.00	0.00
1.35		14.13	5.02	1.20	14303	0.00	0.00
1.40		8.89	6.02	1.37	13875	0.00	0.00
1.60		14.52	12.14	1.40	12986	0.00	0.00
1.80		11.14	23.67	1.43	10975	0.00	0.00
2.00		5.66	39.55	1.45	8405	0.00	0.00
2.45		10.38	70.72	1.21	3083	0.00	0.00
2.45	SINK	28.16	83.93	2.59	708	0.00	0.00

CUMULATIVE RESULTS FOR SIZE 100M X 0

CUMULATIVE DOWN

GRAVITY		% WT	% ASH	% S	BTU	VOLATILE	FIXED CARBO
1.25		.27	3.38	1.08	14587	0.00	0.00
1.30		7.12	3.65	1.13	14441	0.00	0.00
1.35		21.24	4.56	1.17	14349	0.00	0.00
1.40		30.13	4.99	1.23	14209	0.00	0.00
1.60		44.65	7.32	1.29	13811	0.00	0.00
1.80		55.79	10.58	1.31	13245	0.00	0.00
2.00		61.45	13.25	1.33	12799	0.00	0.00
2.45		71.84	21.56	1.31	11395	0.00	0.00
2.45	SINK	100.00	39.12	1.67	8441	0.00	0.00

CUMULATIVE UP

GRAVITY		% WT	% ASH	% S	BTU	VOLATILE	FIXED CARBO
1.25		100.00	39.12	1.67	8441	0.00	0.00
1.30		99.73	39.22	1.67	8425	0.00	0.00
1.35		92.88	41.84	1.71	7981	0.00	0.00
1.40		78.76	48.45	1.80	6847	0.00	0.00
1.60		69.87	53.84	1.86	5954	0.00	0.00
1.80		55.35	64.79	1.98	4108	0.00	0.00
2.00		44.21	75.14	2.12	2078	0.00	0.00
2.45		38.55	80.37	2.22	1894	0.00	0.00
2.45	SINK	28.16	83.93	2.59	708	0.00	0.00

ANALYTICAL RESULTS ARE STATED ON A DRY BASIS

WASHABILITY WITH ORGANIC SOLUTION BY GOULD ENERGY DIVISION

GOULD ENERGY DIVISION
P.O. BOX 214
CRESSON, PA 16630

STANDARD LABORATORIES, INC.

DATE: 4-30-92
MASTER SAMPLE NO. 1538

C.Q., INC.
1 QUALITY CENTER BOX 280
HOMER CITY, PA 15748

SAMPLE ID: RUN #91112109 PRATT SEAM

OPERATING CO.: PROJECT #90D010J TASK 2.82
MINE: DATE SAMPLED:
SAMPLED BY: CUSTOMER PROVIDED
GROSS WEIGHT: 327.4 KG DATE RECEIVED: 3/20/9[illegible]

OTHER ID: AS RECEIVED CRUSHED TO 3/8" WEIGHT PERCENTS REPORTED ON A DRY BASIS
ASH PERCENTS ON AN SO3-FREE BASIS

FEED FOR COMPOSITE 3/8" SQ X 0

GRAVITY		% WT	% ASH	% S	BTU	VOLATILE	FIXED CARB
1.25		.80	2.79	1.24	14696	0.00	0.0
1.30		33.23	4.09	1.48	14416	0.00	0.0
1.35		19.66	7.75	2.46	13792	0.00	0.0
1.40		7.95	12.50	3.00	12958	0.00	0.0
1.60		9.57	21.10	2.99	11508	0.00	0.0
1.80		5.25	34.91	2.44	9151	0.00	0.0
2.00		3.23	50.83	2.56	6560	0.00	0.0
2.45		5.82	73.41	2.26	2732	0.00	0.0
2.45	SINK	14.48	87.37	2.11	632	0.00	0.0

CUMULATIVE RESULTS FOR COMPOSITE 3/8" SQ X 0

CUMULATIVE DOWN

GRAVITY		% WT	% ASH	% S	BTU	VOLATILE	FIXED CARB
1.25		.80	2.79	1.24	14696	0.00	0.0
1.30		34.03	4.06	1.48	14423	0.00	0.0
1.35		53.69	5.41	1.84	14192	0.00	0.0
1.40		61.64	6.33	1.99	14033	0.00	0.0
1.60		71.21	8.31	2.12	13693	0.00	0.0
1.80		76.46	10.14	2.14	13381	0.00	0.0
2.00		79.70	11.79	2.16	13105	0.00	0.0
2.45		85.52	15.98	2.17	12398	0.00	0.0
2.45	SINK	100.00	26.32	2.16	10694	0.00	0.0

CUMULATIVE UP

GRAVITY		% WT	% ASH	% S	BTU	VOLATILE	FIXED CARB
1.25		100.00	26.32	2.16	10694	0.00	0.0
1.30		99.20	26.51	2.16	10662	0.00	0.0
1.35		65.97	37.80	2.51	8771	0.00	0.0
1.40		46.31	50.56	2.53	6640	0.00	0.0
1.60		38.36	58.45	2.43	5331	0.00	0.0
1.80		28.79	70.87	2.25	3276	0.00	0.0
2.00		23.54	78.90	2.21	1966	0.00	0.0
2.45		20.30	83.37	2.15	1234	0.00	0.0
2.45	SINK	14.48	87.37	2.11	632	0.00	0.0

ANALYTICAL RESULTS ARE STATED ON A DRY BASIS

WASHABILITY WITH ORGANIC SOLUTION BY GOULD ENERGY DIVISION

GOULD ENERGY DIVISION
P. O. BOX 214
CRESSON, PA 16630

STANDARD LABORATORIES, INC.

DATE : 5- 1-92
MASTER SAMPLE NO. 153841

C. Q. , INC.
1 QUALITY CENTER BOX 280
HOMER CITY, PA 15748

SAMPLE ID: RUN #91112100 PRATT SEAM

ERATING CO.: PROJECT #90D0101 TASK 2.3
INE: DATE SAMPLED:
AMPLED BY: CUSTOMER PROVIDED
OSS WEIGHT: 327.4 KG DATE RECEIVED: 3/20/982

THER ID: AS-RECEIVED CRUSHED TO 3/8" WEIGHT PERCENTS REPORTED ON A DRY BASIS
ASH PERCENTS ON AN SO3-FREE BASIS

FEED FOR SIZE 100M X 0

AVITY		% WT	% ASH	% S	BTU	VOLATILE	FIXED CARBON
.25		0.00	0.00	0.00	0	0.00	0.00
.30		12.02	2.06	1.05	14474	0.00	0.00
35		24.52	3.53	1.13	14132	0.00	0.00
40		7.35	7.70	1.41	13504	0.00	0.00
.60		11.63	12.96	1.42	12387	0.00	0.00
.80		3.02	26.54	2.22	10189	0.00	0.00
00		2.57	41.08	1.49	7607	0.00	0.00
45		5.12	68.59	1.63	3456	0.00	0.00
45	SINK	33.76	88.94	2.12	352	0.00	0.00

CUMULATIVE RESULTS FOR SIZE 100M X 0

CUMULATIVE DOWN

AVITY		% WT	% ASH	% S	BTU	VOLATILE	FIXED CARBON
.25		0.00	0.00	0.00	0	0.00	0.00
.30		12.02	2.06	1.05	14474	0.00	0.00
35		36.54	3.04	1.11	14244	0.00	0.00
40		43.89	3.82	1.16	14120	0.00	0.00
.60		55.53	5.74	1.21	13757	0.00	0.00
.80		58.55	6.81	1.26	13573	0.00	0.00
.00		61.12	8.25	1.27	13322	0.00	0.00
.45		66.24	12.92	1.30	12560	0.00	0.00
.45	SINK	100.00	38.59	1.58	8438	0.00	0.00

CUMULATIVE UP

AVITY	% WT	% ASH	% S	BTU	VOLATILE	FIXED CARBON
.25	100.00	38.59	1.58	8438	0.00	0.00
.30	100.00	38.59	1.58	8438	0.00	0.00
.35	87.98	43.58	1.65	7613	0.00	0.00
.40	63.46	59.05	1.85	5094	0.00	0.00
.60	56.11	65.78	1.91	3992	0.00	0.00
.80	44.47	79.59	2.03	1797	0.00	0.00
.00	41.45	83.46	2.02	1185	0.00	0.00
.45	38.88	86.26	2.05	761	0.00	0.00
.45 SINK	33.76	88.94	2.12	352	0.00	0.00

ANALYTICAL RESULTS ARE STATED ON A DRY BASIS

WASHABILITY WITH CESIUM CHLORIDE BY PROCESS TECH

Thomas A. Pratt

GOULD ENERGY DIVISION
P. O. BOX 214
CRESSON, PA 16630

STANDARD LABORATORIES, INC.

DATE : 5- 1-92
MASTER SAMPLE NO. 153841

C. Q., INC.
1 QUALITY CENTER BOX 280
HOMER CITY, PA 15748

SAMPLE ID: RUN #91112100 PRATT SEAM

OPERATING CO: PROJECT #9OD0101 TASK 2 3
MINE: DATE SAMPLED:
SAMPLED BY: CUSTOMER PROVIDED
ROSS WEIGHT: 327.4 KG DATE RECEIVED: 8/20/9B2

OTHER ID: AS RECEIVED CRUSHED TO 3/8" WEIGHT PERCENTS REPORTED ON A DRY BASIS
ASH PERCENTS ON AN SO3-FREE BASIS

FEED FOR COMPOSITE 3/8" SQ X 0

AVITY		% WT	% ASH	% S	BTU	VOLATILE	FIXED CARBON
.25		.77	2.76	1.25	14710	0.00	0.00
1.30		33.86	4.03	1.47	14395	0.00	0.00
1.35		20.91	7.37	2.37	13798	0.00	0.00
.40		7.77	12.84	3.04	12893	0.00	0.00
.60		9.22	21.56	3.06	11360	0.00	0.00
.80		4.27	37.75	2.74	8664	0.00	0.00
2.00		2.86	52.47	2.71	6232	0.00	0.00
2.45		5.19	73.48	2.44	2734	0.00	0.00
.45	SINK	15.16	88.57	2.00	494	0.00	0.00

CUMULATIVE RESULTS FOR COMPOSITE 3/8" SQ X 0

CUMULATIVE DOWN

RAVITY		% WT	% ASH	% S	BTU	VOLATILE	FIXED CARBON
1.25		.77	2.76	1.25	14710	0.00	0.00
.30		34.62	4.00	1.46	14402	0.00	0.00
.35		55.54	5.27	1.80	14174	0.00	0.00
1.40		63.31	6.20	1.95	14017	0.00	0.00
1.60		72.53	8.15	2.10	13679	0.00	0.00
.80		76.80	9.80	2.13	13401	0.00	0.00
.00		79.66	11.33	2.15	13143	0.00	0.00
2.45		84.84	15.13	2.17	12507	0.00	0.00
2.45	SINK	100.00	26.26	2.14	10686	0.00	0.00

CUMULATIVE UP

AVITY		% WT	% ASH	% S	BTU	VOLATILE	FIXED CARBON
.25		100.00	26.26	2.14	10686	0.00	0.00
1.30		99.23	26.44	2.15	10655	0.00	0.00
1.35		65.38	38.05	2.50	8718	0.00	0.00
.40		44.46	52.48	2.57	6329	0.00	0.00
.60		36.69	60.87	2.47	4939	0.00	0.00
.80		27.47	74.07	2.27	2783	0.00	0.00
2.00		23.20	80.75	2.18	1701	0.00	0.00
2.45		20.34	84.72	2.11	1065	0.00	0.00
.45	SINK	15.16	88.57	2.00	494	0.00	0.00

ANALYTICAL RESULTS ARE STATED ON A DRY BASIS

WASHABILITY WITH CESIUM CHLORIDE BY PROCESS TECH

GOULD ENERGY DIVISION
P O BOX 214
CRESSON, PA 16630
STANDARD LABORATORIES, INC.

DATE 4-28-92
MASTER SAMPLE NO. 144711

C Q , INC
1 QUALITY CENTER BOX 280
HOMER CITY, PA 15748 SAMPLE ID: RUN #911121100 BRATT SEAM

PERATING CO: PROJECT 90D0191 TASK 2.4
INE DATE SAMPLED
AMPLED BY: CUSTOMER PROVIDED
ROSS WEIGHT: 35.70 KG DATE RECEIVED: 1/17/92

THER ID: RAW COAL LIBERATION CRUSHED TO 100M X 0 WEIGHT PERCENTS REPORTED ON A DRY BASIS ASH PERCENTS ON AN SO3-FREE BASIS

CERTIFICATE OF ANALYSIS

FRACTION	WT%	MOISTURE	ASH	SULFUR	BTU	LBS SO2 PER MBTU	MAF BTU
100M	2.80	1.03	19.67	2.07	11933	3.47	14855
100M X 325M	56.16	9.04	20.18	2.60	11698	4.44	14655
325M X 0	41.05	2.25	35.64	1.85	9084	4.07	14114

CUMULATIVE RETAINED - DOWN

FRACTION	WT%	ASH	SULFUR	BTU	LBS SO2 PER MBTU
100M	2.80	19.67	2.07	11933	3.47
+100M X 325M	58.95	20.15	2.57	11709	4.39
+100M X 0	100.00	26.51	2.27	10632	4.27

CUMULATIVE RETAINED - UP

FRACTION	WT%	ASH	SULFUR	BTU	LBS SO2 PER MBTU
100M X 0	100.00	26.51	2.27	10632	4.27
100M X 0	97.20	26.71	2.28	10594	4.30
325M X 0	41.05	35.64	1.85	9084	4.07

NALYTICAL RESULTS ARE STATED ON A DRY BASIS

PAGE 1

APPROVED BY Thomas A. Light

APPROVED BY Lori Lotney

GOULD ENERGY DIVISION
P.O.BOX 214
CRESSON, PA 16630
STANDARD LABORATORIES, INC.

DATE 4-28-92
MASTER SAMPLE NO. 144715

C. Q., INC.
1 QUALITY CENTER BOX 280
HOMER CITY, PA 15748

SAMPLE ID: RUN #911121OO, BRADY SEAM

PERATING CO.: PROJECT 90D0101 TASK 2.4
INE:
AMPLED BY: CUSTOMER PROVIDED
ROSS WEIGHT: 35.70 KG

DATE SAMPLED:
DATE RECEIVED: 1/17/92

THER ID: RAW COAL LIBERATION CRUSHED TO 1COM X 0 WEIGHT PERCENTS REPORTED ON A DRY BASIS ASH PERCENTS ON AN SO3-FREE BASIS

	% WT.	% MOIST.	% ASH	%SULFUR	BTU	% VOL.	% FIX. CAR.
AW	100.00	1.89	25.68	2.20	10459	0.00	0.00
			26.18	2.24	10660	0.00	0.00
					14440 (MAF)		

RAVITY		% WT	% ASH	% S	BTU	VOLATILE	FIXED CARBON
.25		0.00	0.00	0.00	0	0.00	0.00
.30		16.27	2.31	1.11	14648	0.00	0.00
1.35		18.93	4.23	1.39	14269	0.00	0.00
1.40		11.80	6.79	1.62	13910	0.00	0.00
.60		14.87	13.98	2.11	12668	0.00	0.00
.80		12.13	23.51	2.14	11250	0.00	0.00
.00		4.18	42.76	2.36	8006	0.00	0.00
2.45		4.47	65.68	2.45	4188	0.00	0.00
2.45	SINK	17.36	83.80	4.77	953	0.00	0.00

WASHABILITY WITH ORGANIC SOLUTION BY GOULD ENERGY DIVISION

GOULD ENERGY DIVISION
P.O.BOX 214
CRESSON, PA 16630
STANDARD LABORATORIES,INC.

DATE : 4-28-92
MASTER SAMPLE NO. 144715

C.Q., INC.
1 QUALITY CENTER BOX 280
HOMER CITY, PA 15748 SAMPLE ID: RUN #911121OO CRAIT SEAM

OPERATING CO: PROJECT #0D0101 TASK 2.4
MINE: DATE SAMPLED:
SAMPLED BY: CUSTOMER PROVIDED
GROSS WEIGHT: 35.70 KG DATE RECEIVED: 1/17/92

OTHER ID: RAW COAL LIBERATION CRUSHED TO 100M X 0 WEIGHT PERCENTS REPORTED ON A DRY BASIS ASH PERCENTS ON AN SO3-FREE BASIS

CUMULATIVE RESULTS FOR RAW

CUMULATIVE DOWN

GRAVITY		% WT	% ASH	% S	BTU	VOLATILE	FIXED CARBON
1.25		0.00	0.00	0.00	0	0.00	0.00
1.30		16.27	2.31	1.11	14648	0.00	0.00
1.35		35.20	3.34	1.26	14444	0.00	0.00
1.40		47.00	4.21	1.35	14310	0.00	0.00
1.60		61.86	6.56	1.53	13915	0.00	0.00
1.80		73.99	9.34	1.63	13478	0.00	0.00
2.00		78.17	11.12	1.67	13186	0.00	0.00
2.45		82.64	14.07	1.71	12699	0.00	0.00
2.45	SINK	100.00	26.18	2.24	10660	0.00	0.00

CUMULATIVE UP

GRAVITY		% WT	% ASH	% S	BTU	VOLATILE	FIXED CARBON
1.25		100.00	26.18	2.24	10660	0.00	0.00
1.30		100.00	26.18	2.24	10660	0.00	0.00
1.35		83.73	30.81	2.46	9886	0.00	0.00
1.40		64.80	38.58	2.78	8605	0.00	0.00
1.60		53.00	45.66	3.04	7424	0.00	0.00
1.80		38.14	58.01	3.40	5380	0.00	0.00
2.00		26.01	74.09	3.98	2642	0.00	0.00
2.45		21.83	80.09	4.30	1615	0.00	0.00
2.45	SINK	17.36	83.80	4.77	953	0.00	0.00

ANALYTICAL RESULTS ARE STATED ON A DRY BASIS

WASHABILITY WITH ORGANIC SOLUTION BY GOULD ENERGY DIVISION

GOULD ENERGY DIVISION
P.O. BOX 214
CRESSON, PA 16630
STANDARD LABORATORIES, INC.

DATE: 4-29-92
MASTER SAMPLE NO. 144715

C.Q., INC.
1 QUALITY CENTER BOX 280
HOMER CITY, PA 15748 SAMPLE ID: RUN #911112100,BRATT SEAM

PERATING CO.: PROJECT #0D0101 TASK 2.4
INE: DATE SAMPLED:
AMPLED BY: CUSTOMER PROVIDED
ROSS WEIGHT: 35.70 KG DATE RECEIVED: 1/17/92

THER ID: RAW COAL LIBERATION CRUSHED TO 100M X 0 WEIGHT PERCENTS REPORTED ON A DRY BASIS ASH PERCENTS ON AN SO3-FREE BASIS

	% WT.	% MOIST.	% ASH	%SULFUR	BTU	% VOL.	% FIX. CAR.
AW	100.00	1.89	25.42	2.35	10482	0.00	0.00
			25.91	2.40	10684	0.00	0.00
					14420 (MAF)		

RAVITY		% WT	% ASH	% S	BTU	VOLATILE	FIXED CARBON
.25		.57	2.60	1.12	15117	0.00	0.00
.30		37.06	3.36	1.32	14478	0.00	0.00
1.35		15.47	5.66	1.62	13766	0.00	0.00
1.40		7.39	9.81	2.22	13269	0.00	0.00
.60		10.64	18.12	2.80	11899	0.00	0.00
.80		3.77	33.63	3.49	9190	0.00	0.00
.00		2.32	45.99	3.02	7185	0.00	0.00
2.45		4.96	67.54	2.74	3682	0.00	0.00
2.45	SINK	17.82	86.43	4.77	724	0.00	0.00

WASHABILITY WITH CESIUM CHLORIDE BY PROCESS TECH

GOULD ENERGY DIVISION
P.O. BOX 214
CRESSON, PA 16630
STANDARD LABORATORIES, INC.

DATE : 4-29-92
MASTER SAMPLE NO. 144715

C.Q., INC.
1 QUALITY CENTER BOX 280
HOMER CITY, PA 15748 SAMPLE ID: RUN #91112100 PRATT SEAM

OPERATING CO.: PROJECT 90DG101 TASK 2.4
LINE: DATE SAMPLED:
SAMPLED BY: CUSTOMER PROVIDED
GROSS WEIGHT: 35.70 KG DATE RECEIVED: 1/17/92

OTHER ID: RAW COAL LIBERATION CRUSHED TO 100M X 0 WEIGHT PERCENTS REPORTED ON A DRY BASIS ASH PERCENTS ON AN SO3-FREE BASIS

CUMULATIVE RESULTS FOR RAW

CUMULATIVE DOWN

GRAVITY		% WT	% ASH	% S	BTU	VOLATILE	FIXED CARBON
1.25		.57	2.60	1.12	15117	0.00	0.00
1.30		37.63	3.35	1.32	14488	0.00	0.00
1.35		53.10	4.08	1.41	14336	0.00	0.00
1.40		60.49	4.78	1.50	14205	0.00	0.00
1.60		71.13	6.78	1.70	13860	0.00	0.00
1.80		74.90	8.13	1.79	13625	0.00	0.00
2.00		77.22	9.27	1.83	13432	0.00	0.00
2.45		82.18	12.78	1.88	12843	0.00	0.00
2.45	SINK	100.00	25.91	2.40	10684	0.00	0.00

CUMULATIVE UP

GRAVITY		% WT	% ASH	% S	BTU	VOLATILE	FIXED CARBON
1.25		100.00	25.91	2.40	10684	0.00	0.00
1.30		99.43	26.04	2.40	10658	0.00	0.00
1.35		62.37	39.52	3.04	8389	0.00	0.00
1.40		46.90	50.62	3.52	6549	0.00	0.00
1.60		39.51	58.25	3.76	5292	0.00	0.00
1.80		28.87	73.04	4.11	2857	0.00	0.00
2.00		25.10	78.96	4.21	1906	0.00	0.00
2.45		22.78	82.32	4.33	1368	0.00	0.00
2.45	SINK	17.82	86.43	4.77	724	0.00	0.00

ANALYTICAL RESULTS ARE STATED ON A DRY BASIS

WASHABILITY WITH CESIUM CHLORIDE BY PROCESS TECH

Thomas A. Knight
Supervisor

APPENDIX D

Utley Seam Raw Coal Liberation Data

GOULD ENERGY DIVISION
P.O. BOX 214
CRESSON, PA 16630

STANDARD LABORATORIES, INC.

DATE : 5- 1-92
MASTER SAMPLE NO. 153056

C. G., INC.
1 QUALITY CENTER BOX 280
HOMER CITY, PA 15748

SAMPLE ID: RUN #911210I UTTLEY SEAM

OPERATING CO: PROJECT 90D010I TASK 2-3
MINE:
SAMPLED BY: BOB DOSPOY
GROSS WEIGHT: 305.8

DATE SAMPLED:
DATE RECEIVED: 8/13/92

OTHER ID: AS RECEIVED CRUSHED TO 3/8" WEIGHT PERCENTS REPORTED ON A DRY BASIS
ASH PERCENTS ON AN SO3-FREE BASIS

CERTIFICATE OF ANALYSIS

FRACTION	WT%	MOISTURE	ASH	SULFUR	BTU	LBS SO2 PER MBTU	MAF BTU
+3/8"SQ	2.88	2.18	17.30	4.35	12355	7.03	15270
3/8"SQ X 28M	80.86	2.59	11.09	4.15	13380	6.20	15449
28M X 100M	6.54	1.31	14.80	2.93	12708	4.61	15112
100M X 325M	2.74	1.18	17.65	2.37	12160	3.89	14766
325M X 0	6.97	1.84	54.37	1.59	5860	5.42	12842

CUMULATIVE RETAINED - DOWN

FRACTION	WT%	ASH	SULFUR	BTU	LBS SO2 PER MBTU
+3/8"SQ	2.88	17.30	4.35	12355	7.03
+3/8"SQ X 28M	83.74	11.31	4.15	13345	6.21
+3/8"SQ X 100M	90.28	11.56	4.07	13299	6.12
+3/8"SQ X 325M	93.03	11.74	4.02	13265	6.06
+3/8"SQ X 0	100.00	14.71	3.85	12749	6.03

CUMULATIVE RETAINED - UP

FRACTION	WT%	ASH	SULFUR	BTU	LBS SO2 PER MBTU
+3/8"SQ X 0	100.00	14.71	3.85	12749	6.03
3/8"SQ X 0	97.12	14.64	3.83	12760	6.00
28M X 0	16.26	32.25	2.26	9679	4.67
100M X 0	9.72	44.00	1.81	7640	4.73
325M X 0	6.97	54.37	1.59	5860	5.42

ANALYTICAL RESULTS ARE STATED ON A DRY BASIS

PAGE 1

APPROVED BY Thomas A. Light

APPROVED BY

GOULD ENERGY DIVISION
P.O. BOX 214
CRESSON, PA 16630

STANDARD LABORATORIES, INC.

DATE : 5-11-92
MASTER SAMPLE NO. 153062

C.Q., INC.
1 QUALITY CENTER BOX 280
HOMER CITY, PA 15748

SAMPLE ID: RUN#911112101 UTTLEY SEAM

OPERATING CO.: PROJECT 90D0101 TASK 2.3
MINE:
SAMPLED BY: BOB DOSPOY
GROSS WEIGHT: 305.6

DATE SAMPLED:
DATE RECEIVED: 5/13/92

OTHER ID: AS RECEIVED CRUSHED TO 3/8" WEIGHT PERCENTS REPORTED ON A DRY BASIS
ASH PERCENTS ON AN SO3-FREE BASIS

FEED FOR SIZE 3/8"SQ X 28M

GRAVITY		% WT	% ASH	% S	BTU	VOLATILE	FIXED CARBON
1.25		1.67	2.27	1.53	14866	0.00	0.00
1.30		47.99	2.99	2.13	14691	0.00	0.00
1.35		25.75	6.98	4.15	13994	0.00	0.00
1.40		8.01	11.09	5.46	13412	0.00	0.00
1.60		7.58	18.67	7.36	11956	0.00	0.00
1.80		1.49	32.48	9.78	9556	0.00	0.00
2.00		1.13	46.15	9.65	7204	0.00	0.00
2.45		2.17	68.21	8.16	3491	0.00	0.00
2.45	SINK	4.22	76.89	16.43	2059	0.00	0.00

CUMULATIVE RESULTS FOR SIZE 3/8"SQ X 28M

CUMULATIVE DOWN

GRAVITY		% WT	% ASH	% S	BTU	VOLATILE	FIXED CARBON
1.25		1.67	2.27	1.53	14866	0.00	0.00
1.30		49.67	2.97	2.11	14696	0.00	0.00
1.35		75.41	4.34	2.81	14457	0.00	0.00
1.40		83.42	4.98	3.06	14356	0.00	0.00
1.60		91.00	6.12	3.42	14156	0.00	0.00
1.80		92.48	6.55	3.52	14082	0.00	0.00
2.00		93.61	7.02	3.59	14000	0.00	0.00
2.45		95.78	8.41	3.70	13761	0.00	0.00
2.45	SINK	100.00	11.30	4.24	13268	0.00	0.00

CUMULATIVE UP

GRAVITY		% WT	% ASH	% S	BTU	VOLATILE	FIXED CARBON
1.25		100.00	11.30	4.24	13268	0.00	0.00
1.30		98.33	11.45	4.28	13241	0.00	0.00
1.35		50.33	19.52	6.33	11858	0.00	0.00
1.40		24.59	32.65	8.62	9623	0.00	0.00
1.60		16.58	43.08	10.15	7791	0.00	0.00
1.80		9.00	63.62	12.49	4286	0.00	0.00
2.00		7.52	69.78	13.03	3244	0.00	0.00
2.45		6.39	73.94	13.62	2546	0.00	0.00
2.45	SINK	4.22	76.89	16.43	2059	0.00	0.00

ANALYTICAL RESULTS ARE STATED ON A DRY BASIS

Thomas A. Wright
REVIEWED

GOULD ENERGY DIVISION
P.O. BOX 214
CRESSON, PA 16630

STANDARD LABORATORIES, INC.

DATE : 5-1-92
MASTER SAMPLE NO : 153062

C.O. , INC.
1 QUALITY CENTER BOX 280
HOMER CITY, PA 15748 SAMPLE ID: RUN 491 (210) UTILEY SEAM

OPERATING CO.: PROJECT: ADDITION TASK: 2-3
MINE:
SAMPLED BY: BOB DOSPOY DATE SAMPLED:
GROSS WEIGHT: 305.6 DATE RECEIVED: 3/13/92

OTHER ID: AS RECEIVED CRUSHED 1 1/2 X 3/8" WEIGHT PERCENTS REPORTED ON A DRY BASIS
ASH PERCENTS ON AN SO3-FREE BASIS

FEED FOR SIZE 28M X 100M

GRAVITY		% WT	% ASH	% S	BTU	VOLATILE	FIXED CARBON
1.25		7.56	2.05	1.56	14869	0.00	0.00
1.30		60.14	2.32	1.69	14737	0.00	0.00
1.35		.40	5.64	2.87	14125	0.00	0.00
1.40		6.64	9.46	3.56	13427	0.00	0.00
1.60		8.85	16.62	3.97	12212	0.00	0.00
1.80		3.05	30.72	4.37	9888	0.00	0.00
2.00		1.88	48.14	4.19	7051	0.00	0.00
2.45		4.48	72.06	2.82	3198	0.00	0.00
2.45	SINK	7.00	84.68	7.20	1118	0.00	0.00

CUMULATIVE RESULTS FOR SIZE 28M X 100M

CUMULATIVE DOWN

GRAVITY		% WT	% ASH	% S	BTU	VOLATILE	FIXED CARBON
1.25		7.56	2.05	1.56	14869	0.00	0.00
1.30		67.70	2.29	1.68	14751	0.00	0.00
1.35		68.10	2.30	1.68	14748	0.00	0.00
1.40		74.74	2.94	1.85	14631	0.00	0.00
1.60		83.59	4.39	2.08	14374	0.00	0.00
1.80		86.64	5.32	2.16	14217	0.00	0.00
2.00		88.52	6.23	2.20	14064	0.00	0.00
2.45		93.00	9.40	2.23	13540	0.00	0.00
2.45	SINK	100.00	14.67	2.58	12671	0.00	0.00

CUMULATIVE UP

GRAVITY		% WT	% ASH	% S	BTU	VOLATILE	FIXED CARBON
1.25		100.00	14.67	2.58	12671	0.00	0.00
1.30		92.44	15.70	2.66	12491	0.00	0.00
1.35		82.30	40.62	4.47	8310	0.00	0.00
1.40		31.90	41.06	4.49	8238	0.00	0.00
1.60		25.26	49.36	4.73	6874	0.00	0.00
1.80		16.41	67.01	5.13	3996	0.00	0.00
2.00		13.36	75.29	5.31	2632	0.00	0.00
2.45		11.48	79.75	5.49	1930	0.00	0.00
2.45	SINK	7.00	84.68	7.20	1118	0.00	0.00

ANALYTICAL RESULTS ARE STATED ON A DRY BASIS.

Thomas A. Right
PA/LQ

GOULD ENERGY DIVISION
P.O. BOX 214
CRESSON, PA 16630

STANDARD LABORATORIES, INC.

DATE: 5-1-92
SL MASTER SAMPLE NO. 153062

C.G., INC.
1 QUALITY CENTER BOX 280
HOMER CITY, PA 15748

SAMPLE ID: RUN-971:12101 UTTLEY SEAM

OPERATING CO.: PROJECT: 90D010 TASK: 2.3
MINE:
SAMPLED BY: BOB DOSPOY DATE SAMPLED:
GROSS WEIGHT: 305 # DATE RECEIVED: 4/13/92

OTHER ID: AS-RECEIVED CRUSHED TO 3/8" WEIGHT PERCENTS REPORTED ON A DRY BASIS
ASH PERCENTS ON AN SO3-FREE BASIS

FEED FOR SIZE 100M X 0

GRAVITY		% WT	% ASH	% S	BTU	VOLATILE	FIXED CARBON
1.25		0.00	0.00	0.00	0	0.00	0.00
1.30		6.16	2.02	1.33	14811	0.00	0.00
1.35		11.54	3.25	1.37	14433	0.00	0.00
1.40		4.97	6.31	1.49	13877	0.00	0.00
1.60		9.06	11.46	1.16	13097	0.00	0.00
1.80		6.86	17.72	1.05	12057	0.00	0.00
2.00		22.32	45.77	1.41	7051	0.00	0.00
2.45		18.68	70.35	1.29	3161	0.00	0.00
2.45	SINK	20.39	83.60	2.60	1223	0.00	0.00

CUMULATIVE RESULTS FOR SIZE 100M X 0

CUMULATIVE DOWN

GRAVITY		% WT	% ASH	% S	BTU	VOLATILE	FIXED CARBON
1.25		0.00	0.00	0.00	0	0.00	0.00
1.30		6.16	2.02	1.33	14811	0.00	0.00
1.35		17.70	2.82	1.36	14564	0.00	0.00
1.40		22.67	3.59	1.39	14413	0.00	0.00
1.60		31.73	5.84	1.32	14038	0.00	0.00
1.80		38.60	7.95	1.28	13685	0.00	0.00
2.00		60.92	21.81	1.33	11254	0.00	0.00
2.45		79.61	33.20	1.32	9355	0.00	0.00
2.45	SINK	100.00	43.48	1.58	7696	0.00	0.00

CUMULATIVE UP

GRAVITY		% WT	% ASH	% S	BTU	VOLATILE	FIXED CARBON
1.25		100.00	43.48	1.58	7696	0.00	0.00
1.30		100.00	43.48	1.58	7696	0.00	0.00
1.35		93.84	46.20	1.59	7230	0.00	0.00
1.40		82.30	52.22	1.63	6220	0.00	0.00
1.60		77.33	55.17	1.63	5727	0.00	0.00
1.80		68.27	60.98	1.70	4748	0.00	0.00
2.00		61.40	65.81	1.77	3931	0.00	0.00
2.45		39.08	77.27	1.97	2130	0.00	0.00
2.45	SINK	20.39	83.60	2.60	1223	0.00	0.00

ANALYTICAL RESULTS ARE STATED ON A DRY BASIS

WASHABILITY WITH ORGANIC SOLUTION BY GOULD ENERGY DIVISION

Thomas A. Right
Reviewed

GOULD ENERGY DIVISION
P.O.BOX 214
CRESSON, PA 16630

STANDARD LABORATORIES, INC.

DATE 5-1-92
HASLER SAMPLE NO. 158062

C.Q.I., INC.
51 QUALITY CENTER RD. STE 280
HOMER CITY, PA 15748

SAMPLE ID: RUN 1571 (2)01 OUTLET SEAM

OPERATING CO.: PROJECT: 920010I TASK: 2.0
MINE:
SAMPLED BY: BOB DOSPOY
GROSS WEIGHT: 305.6

DATE REPLICED:
DATE RECEIVED: 4/13/92

OTHER ID: AS RECEIVED CRUSHED TO 3/8" WEIGHT PERCENTS REPORTED ON A DRY BASIS
ASH PERCENTS ON AN SO3-FREE BASIS

FEED FOR COMPOSITE 3/8"SQ X 0

SPECIFIC GRAVITY		% WT	% ASH	% S	BTU	VOLATILE	FIXED CARBON
1.25		1.90	2.21	1.54	14867	0.00	0.00
1.30		44.72	2.92	2.08	14696	0.00	0.00
1.35		22.71	6.79	4.01	14015	0.00	0.00
1.40		7.63	10.69	5.10	13443	0.00	0.00
1.60		7.80	17.70	6.41	12103	0.00	0.00
1.80		2.11	27.65	6.51	10378	0.00	0.00
2.00		3.24	45.97	3.92	7095	0.00	0.00
2.45		3.93	69.48	4.58	3317	0.00	0.00
2.45	SINK	5.97	79.72	11.13	1709	0.00	0.00

CUMULATIVE RESULTS FOR COMPOSITE 3/8"SQ X 0

CUMULATIVE DOWN

SPECIFIC GRAVITY		% WT	% ASH	% S	BTU	VOLATILE	FIXED CARBON
1.25		1.90	2.21	1.54	14867	0.00	0.00
1.30		46.62	2.89	2.06	14703	0.00	0.00
1.35		69.32	4.17	2.70	14478	0.00	0.00
1.40		76.95	4.82	2.94	14375	0.00	0.00
1.60		84.75	6.00	3.26	14166	0.00	0.00
1.80		86.86	6.53	3.33	14074	0.00	0.00
2.00		90.10	7.94	3.36	13823	0.00	0.00
2.45		94.03	10.52	3.41	13384	0.00	0.00
2.45	SINK	100.00	14.65	3.87	12687	0.00	0.00

CUMULATIVE UP

SPECIFIC GRAVITY		% WT	% ASH	% S	BTU	VOLATILE	FIXED CARBON
1.25		100.00	14.65	3.87	12687	0.00	0.00
1.30		98.10	14.89	3.91	12645	0.00	0.00
1.35		53.38	24.91	5.45	10927	0.00	0.00
1.40		30.68	38.33	6.51	8641	0.00	0.00
1.60		23.05	47.47	6.98	7052	0.00	0.00
1.80		15.25	62.71	7.27	4467	0.00	0.00
2.00		13.14	68.34	7.40	3517	0.00	0.00
2.45		9.90	75.66	8.53	2347	0.00	0.00
2.45	SINK	5.97	79.72	11.13	1709	0.00	0.00

ANALYTICAL RESULTS ARE STATED ON A DRY BASIS

WASHABILITY WITH ORGANIC SOLUTION BY GOULD ENERGY DIVISION

Thomas A. Right
RCHQ

GOULD ENERGY DIVISION
P.O.BOX 214
CRESSON, PA 16630

STANDARD LABORATORIES, INC.

DATE : 5- 1-92
MASTER SAMPLE NO. 153062

C Q , INC
1 QUALITY CENTER BOX 280
HOMER CITY, PA 15748 SAMPLE ID: RUN #911121 01 UTTLEY SEAM

OPERATING CO.: PROJECT: P0D0101 TASK: 2.3
MINE: DATE SAMPLED:
SAMPLED BY: BOB DOSPOY
GROSS WEIGHT: 305.6 DATE RECEIVED: 3/13/92

OTHER ID: AS RECEIVED CRUSHED TO 0/8" WEIGHT PERCENTS REPORTED ON A DRY BASIS
ASH PERCENTS ON AN SO3-FREE BASIS

FEED FOR SIZE 100M X 0

GRAVITY		% WT	% ASH	% S	BTU	VOLATILE	FIXED CARBON
1.25		.42	0.00	0.00	0	0.00	0.00
1.30		24.64	2.02	1.33	14811	0.00	0.00
1.35		10.02	3.25	1.37	14433	0.00	0.00
1.40		4.66	6.31	1.49	13877	0.00	0.00
1.60		10.81	11.46	1.16	13097	0.00	0.00
1.80		2.97	17.72	1.05	12057	0.00	0.00
2.00		2.31	45.77	1.41	7051	0.00	0.00
2.45		7.10	70.35	1.29	3161	0.00	0.00
2.45	SINK	37.06	83.60	2.60	1223	0.00	0.00

CUMULATIVE RESULTS FOR SIZE 100M X 0

CUMULATIVE DOWN

GRAVITY		% WT	% ASH	% S	BTU	VOLATILE	FIXED CARBON
1.25		.42	0.00	0.00	0	0.00	0.00
1.30		25.06	1.99	1.31	14562	0.00	0.00
1.35		35.08	2.35	1.33	14525	0.00	0.00
1.40		39.74	2.81	1.35	14449	0.00	0.00
1.60		50.56	4.66	1.31	14160	0.00	0.00
1.80		53.53	5.39	1.29	14043	0.00	0.00
2.00		55.84	7.06	1.30	13754	0.00	0.00
2.45		62.94	14.20	1.30	12559	0.00	0.00
2.45	SINK	100.00	39.92	1.78	8357	0.00	0.00

CUMULATIVE UP

GRAVITY		% WT	% ASH	% S	BTU	VOLATILE	FIXED CARBON
1.25		100.00	39.92	1.78	8357	0.00	0.00
1.30		99.58	40.09	1.79	8393	0.00	0.00
1.35		74.94	52.61	1.94	6282	0.00	0.00
1.40		64.92	60.23	2.02	5024	0.00	0.00
1.60		60.26	64.40	2.07	4339	0.00	0.00
1.80		49.44	75.97	2.26	2424	0.00	0.00
2.00		46.47	79.70	2.34	1809	0.00	0.00
2.45		44.16	81.47	2.39	1535	0.00	0.00
2.45	SINK	37.06	83.60	2.60	1223	0.00	0.00

ANALYTICAL RESULTS ARE STATED ON A DRY BASIS

WASHABILITY WITH CESIUM CHLORIDE BY PROCESS TECH

Thomas A. Right
REVIEWED

GOULD ENERGY DIVISION
P.O.BOX 214
CRESSON, PA 16630

STANDARD LABORATORIES, INC.

DATE : 5- 1-92
MASTER SAMPLE NO. 153062

C.Q., INC.
1 QUALITY CENTER BOX 280
HOMER CITY, PA 15748

SAMPLE ID: RUN #91112101 UTTLEY SEAM

OPERATING CO.: PROJECT 90D0101 TASK 2.3
MINE:
SAMPLED BY: BOB DOSPOY
GROSS WEIGHT: 305.6

DATE SAMPLED:
DATE RECEIVED: 9/13/92

OTHER ID: AS RECEIVED CRUSHED TO 3/8" WEIGHT PERCENTS REPORTED ON A DRY BASIS
ASH PERCENTS ON AN SO3-FREE BASIS

FEED FOR COMPOSITE 3/8" SQ X 0

GRAVITY		% WT	% ASH	% S	BTU	VOLATILE	FIXED CARBON
1.25		1.94	2.16	1.51	14554	0.00	0.00
1.30		46.52	2.89	2.05	14701	0.00	0.00
1.35		22.56	6.81	4.03	14013	0.00	0.00
1.40		7.60	10.71	5.12	13441	0.00	0.00
1.60		7.97	17.57	6.30	12125	0.00	0.00
1.80		1.73	29.82	7.70	10011	0.00	0.00
2.00		1.29	46.28	7.70	7163	0.00	0.00
2.45		2.80	69.14	5.91	3379	0.00	0.00
2.45	SINK	7.59	80.55	9.31	1605	0.00	0.00

CUMULATIVE RESULTS FOR COMPOSITE 3/8" SQ X 0

CUMULATIVE DOWN

GRAVITY		% WT	% ASH	% S	BTU	VOLATILE	FIXED CARBON
1.25		1.94	2.16	1.51	14554	0.00	0.00
1.30		48.45	2.86	2.03	14695	0.00	0.00
1.35		71.01	4.11	2.66	14478	0.00	0.00
1.40		78.61	4.75	2.90	14378	0.00	0.00
1.60		86.58	5.93	3.21	14170	0.00	0.00
1.80		88.32	6.40	3.30	14089	0.00	0.00
2.00		89.61	6.97	3.37	13989	0.00	0.00
2.45		92.41	8.86	3.44	13667	0.00	0.00
2.45	SINK	100.00	14.30	3.89	12752	0.00	0.00

CUMULATIVE UP

GRAVITY		% WT	% ASH	% S	BTU	VOLATILE	FIXED CARBON
1.25		100.00	14.30	3.89	12752	0.00	0.00
1.30		98.06	14.54	3.94	12716	0.00	0.00
1.35		51.55	25.06	5.64	10925	0.00	0.00
1.40		28.99	39.26	6.89	8522	0.00	0.00
1.60		21.39	49.40	7.52	6775	0.00	0.00
1.80		13.42	68.32	8.24	3596	0.00	0.00
2.00		11.68	74.02	8.32	2645	0.00	0.00
2.45		10.39	77.47	8.39	2084	0.00	0.00
2.45	SINK	7.59	80.55	9.31	1605	0.00	0.00

ANALYTICAL RESULTS ARE STATED ON A DRY BASIS

WASHABILITY WITH CESIUM CHLORIDE BY PROCESS TECH

Thomas A. Light
P.E.

GOULD ENERGY DIVISION
P.O.BOX 214
CRESSON, PA 16630

STANDARD LABORATORIES,INC.

DATE : 7-22-92
MASTER SAMPLE NO. 165768

C.Q., INC.
1 QUALITY CENTER BOX 280
HOMER CITY, PA 15748

SAMPLE ID: RUN #91112101 UTTLEY SEAM (+100M X 0)

OPERATING CO.: PROJECT #90D0101 TASK 2.3
MINE:
SAMPLED BY: BOB DOSPOY
GROSS WEIGHT: 35.5 KG

DATE SAMPLED:
DATE RECEIVED: 6/11/92

OTHER ID: RAW COAL LIBERATION CR TO 100M AS REC'D WT PERCENTS ON A DRY BASIS A SH PERCENTS ON AN SO3-FREE BASIS THIS REPORT SUPERCEDES ALL PRIOR REPORTS WI TH TE SAME LAB NUMBER

	% WT.	% MOIST.	% ASH	%SULFUR	BTU	% VOL.	% FIX. CAR.
RAW	100.00	1.22	12.15	3.40	12754	0.00	0.00
			12.30	3.44	12912	0.00	0.00
					14723 (MAF)		

GRAVITY		% WT	% ASH	% S	BTU	VOLATILE	FIXED CARBON
1.25		2.21	4.57	1.50	14410	0.00	0.00
1.30		50.47	2.32	1.52	14597	0.00	0.00
1.35		18.84	5.37	2.44	14038	0.00	0.00
1.40		6.91	9.27	3.78	13362	0.00	0.00
1.60		9.32	15.76	5.51	12282	0.00	0.00
1.80		2.09	29.24	9.08	9976	0.00	0.00
2.00		1.16	41.06	9.25	7976	0.00	0.00
2.45		2.33	63.98	7.34	4269	0.00	0.00
2.45	SINK	6.67	79.84	14.05	1689	0.00	0.00

UNCORRECTED WASHABILITY WITH CESIUM CHLORIDE BY PROCESS TECH

Thomas A. Right

GOULD ENERGY DIVISION
P.O.BOX 214
CRESSON, PA 16630

STANDARD LABORATORIES, INC.

DATE : 7-22-92
MASTER SAMPLE NO. 165768

C.Q., INC.
1 QUALITY CENTER BOX 280
HOMER CITY, PA 15748

SAMPLE ID: RUN #91112101 UTTLEY SEAM (+100M X 0)

OPERATING CO.: PROJECT #90D0101 TASK 2.3
MINE:
SAMPLED BY: BOB DOSPOY
GROSS WEIGHT: 35.5 KG

DATE SAMPLED:
DATE RECEIVED: 6/11/92

OTHER ID: RAW COAL LIBERATION CR TO 100M AS REC'D WT PERCENTS ON A DRY BASIS A SH PERCENTS ON AN SO3-FREE BASIS THIS REPORT SUPERCEDES ALL PRIOR REPORTS WI TH TE SAME LAB NUMBER

CUMULATIVE RESULTS FOR RAW

CUMULATIVE DOWN

GRAVITY		% WT	% ASH	% S	BTU	VOLATILE	FIXED CARBON
1.25		2.21	4.57	1.50	14410	0.00	0.00
1.30		52.68	2.42	1.52	14569	0.00	0.00
1.35		71.52	3.20	1.76	14444	0.00	0.00
1.40		78.43	3.73	1.94	14349	0.00	0.00
1.60		87.75	5.01	2.32	14129	0.00	0.00
1.80		89.84	5.57	2.47	14033	0.00	0.00
2.00		91.00	6.03	2.56	13956	0.00	0.00
2.45		93.33	7.47	2.68	13714	0.00	0.00
2.45	SINK	100.00	12.30	3.44	12912	0.00	0.00

CUMULATIVE UP

GRAVITY		% WT	% ASH	% S	BTU	VOLATILE	FIXED CARBON
1.25		100.00	12.30	3.44	12912	0.00	0.00
1.30		97.79	12.47	3.48	12878	0.00	0.00
1.35		47.32	23.30	5.58	11044	0.00	0.00
1.40		28.48	35.16	7.65	9063	0.00	0.00
1.60		21.57	43.45	8.90	7686	0.00	0.00
1.80		12.25	64.52	11.47	4189	0.00	0.00
2.00		10.16	71.78	11.96	2999	0.00	0.00
2.45		9.00	75 74	12.31	2357	0.00	0.00
2.45	SINK	6.67	79.84	14.05	1689	0.00	0.00

ANALYTICAL RESULTS ARE STATED ON A DRY BASIS

UNCORRECTED WASHABILITY WITH CESIUM CHLORIDE BY PROCESS TECH

Thomas A. Right

APPENDIX E

Plant and Component Yields

PLANT YIELD CALCULATION

HMC/WOC/FF - FLOWSHEET 1

PLANT FEED (tph)		10
+28M (Wt. %)	41003 - Plant Feed	86.40
HMC YIELD		
HMC Feed (tph)		
Refuse Ash (Wt. %)	41040 - Refuse D&R (+28M)	67.09
Clean Coal	41037 - CC D&R (+29M)	7.61
Feed Ash (Wt. %)	41004 - Deslime OF (+28M)	21.32
Yield-Ash Balance (Wt. %)		76.95
Yield (tph)		6.19
WOC YIELD		
WOC Feed (tph)		
Refuse Ash (Wt. %)	41011 - Second WOC UF	40.44
Clean Coal Ash (Wt. %)	41007 - Prim. WOC OF	31.96
Feed Ash (Wt. %)	41005 - Deslime UF	33.53*
Yield-Ash Balance (Wt. %)		81.50
Yield (tph)		1.19
VARISIEVE YIELD		
Varisieve Feed		
Refuse Ash (Wt. %)	41067 - Varisieve Effluent	41.81
Clean Coal Ash (Wt. %)	41066 - Varisieve Cake	7.78
Feed Ash (Wt. %)	41007 - Prime WOC OF	31.96
Yield-Ash Balance (Wt. %)		28.95
Yield (tph)		0.35
FF YIELD		
FF Feed		
Refuse Ash (Wt. %)	41033 - Flotation Refuse	69.81
Clean Coal Ash (Wt. %)	41032 - Flotation Concentrate	13.63
Feed Ash (Wt. %)	41031 - Flotation Feed	28.58
Yield-Ash Balance (Wt. %)		33.39
Yield (tph)		0.62
Plant Yield (tph)		7.16
Plant Yield (Wt. %)		7.16
Plant Energy Recovery (%)		89.3

* Denotes corrected value.

PLANT YIELD CALCULATION

CONCENTRATING TABLE - FLOWSHEET 2

PLANT FEED (tph)		5
3/8" x 0 (Wt. %)		90.03

CLASSIFYING CYCLONE

Classifying Cyclone Feed (tph)		3.69
Refuse Ash (Wt. %)	41012 - CC Overflow	41.5
Clean Coal Ash (Wt. %)	41013 - CC Underflow	26.28
Feed Ash (Wt. %)	41005 - Deslime Underflow	30.7
Yield, Calculated (%)		84.64
Yield, Calculated (tph)		3.81

CONCENTRATING TABLE FEED

Concentrating Table Feed (tph)		3.81
Refuse Ash (Wt. %)	41016 - Table Refuse	85.00
Clean Coal Ash (Wt. %)	41014 - Table Clean Coal	11.9
Feed Ash (Wt. %)	41013 - CC Underflow	25.68
Yield-Ash Balance (Wt. %)		81.15
Yield (tph)		2.6

Plant Yield (tph)	2.6
Plant Yield (Wt. %)	52
Plant Energy Recovery (%)	64

PLANT YIELD CALCULATION

CONCENTRATING TABLE - FLOWSHEET 3

PLANT FEED (tph)		5.3
1/2" x 0 (Wt. %)	41003 - Plant Feed	94.44
CLASSIFYING CYCLONE		
Classifying Cyclone Feed (tph)		5.02
Refuse Ash (Wt. %)	41012 - CC Overflow	45.36
Clean Coal Ash(Wt. %)	41013 - CC Underflow	14.37
Feed Ash (Wt. %)	41005 - Deslime Underflow	30.7
Yield, Calculated (%)		82.0
Yield, Calculated (tph)		3.64
CONCENTRATING TABLE YIELD		
Concentrating Table Feed (tph)		3.64
Refuse Ash(Wt. %)	41016 - Table Refuse	68.87
Clean Coal Ash (Wt. %)	41014 - Table Clean Coal	9.56
Middlings Ash (Wt. %)	41015 - Table Middlings	47.32
Yield, Calculated (%)		88.3
Yield (tph)		3.06
Plant Yield (tph)		3.06
Plant Yield (Wt. %)		57.6
Plant Energy Recovery (%)		63.3

PLANT YIELD CALCULATION

CONCENTRATING TABLE/SPIRAL - FLOWSHEET 4

PLANT FEED (tph)		5.1
+28M (Wt. %)	41003 - Plant Feed	97.43
CLASSIFYING CYCLONE YIELD		
Classifying Cyclone Feed (tph)		
Refuse Ash (Wt. %)	41012 - CC Overflow	50.08
Clean Coal Ash (Wt. %)	41013 - CT Feed	23.16
Feed Ash (Wt. %)	41005 - Deslime Screen Underflow	30.45
Yield, Calculated (%)		97.6
Yield (tph)		3.76
CONCENTRATING TABLE YIELD		
Concentrating Table Feed (tph)		3.76
Refuse Ash (Wt. %)	41016 - Table Refuse	82.71
Clean Coal Ash (Wt. %)	41014 - Table Clean Coal	9.66
Middlings Ash (Wt. %)	41015 - Table Middlings	59.37
Yield, Calculated (%)		79.11
Yield (tph)		2.97
SPIRAL YIELD		
Spiral Feed (tph)		0.70
Refuse Ash (Wt. %)	Manual	68.76
Clean Coal Ash (Wt. %)	Manual	18.03
Middlings Ash (Wt. %)	Manual	18.79
Yield, Calculated (%)		54.78
Yield (tph)		0.38
VARISIEVE YIELD		
Varisieve Feed (tph)		0.42
Refuse Ash (Wt. %)		23.64
Clean Coal Ash (Wt. %)		6.31
Feed Ash (Wt. %)		14.58
Yield - Ash Balance		52.3
Yield (tph)		0.18
Plant Yield (tph)		2.93
Plant Yield (Wt. %)		57.5
Plant Energy Recovery (%)		73.8